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SPECIAL METHODS ON
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Volume II

February, 1932

Number 1

SPECIAL METHODS ON HIGH-SCHOOL LEVEL

Prepared by the Committee on Special Methods on High-School Level:
H. R. DOUGLASS, CARTER V. GOOD, and WALTER S. MONROE, *Chairman*.

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PREFACE

THE Committee which prepared this number has furnished an introduction in which the limitations of the material are discussed and the procedure followed by the Committee is described. In view of the fact that a good deal of the research which is published does not meet the critical standards of research, the Committee has performed a service to the profession in calling attention to the requirements of acceptable scientific work. By exercising care in including only those publications which yield reliable conclusions, the Committee has been able to devote more space than would otherwise be possible to the description of the publications which are included. This elimination of material which does not meet reasonable standards involves no sacrifice in completeness. It provides a more helpful review than could be written if an attempt were made to include every reference whether it contributes conclusive evidence on its problem or not.

FRANK N. FREEMAN, *Chairman,*
Editorial Board, 1931-32.

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INTRODUCTION

A SUMMARY of research relating to special methods on the high-school level requires the cooperation of specialists in the several subjectmatter fields, at least for the purpose of compiling the bibliography of the researches to be summarized. Most of the persons cooperating with the Committee are listed in the Table of Contents as authors or co-authors. In addition, special mention should be made of Professor F. D. Curtis who kindly furnished the Committee a copy of his revised bibliography in the field of science. In several cases the persons cooperating merely prepared briefs of the researches and the summary was prepared from these briefs by the member of the Committee whose name appears as a co-author or by the chairman of the Committee. In other cases the cooperating specialists prepared the summary. This procedure resulted in some lack of uniformity in the scope and style of the summaries. Mr. Max D. Engelhart has rendered valuable service in checking references and factual details.

Many readers will doubtless be surprised at the relatively small number of references summarized in the several fields. In a few cases, notably in reading and literature, and in language, grammar, and composition, an effort was not made to produce a comprehensive survey, since published summaries were available. For most of the other subjects, however, the authors attempted to include all pertinent researches of value. The field was restricted to the teaching of a particular subject, which was defined to include such topics as motivation, diagnosis and remedial instruction including problem cases, types and methods of assignment, types of learning exercises, questioning and other instructional procedures involved in conducting recitations, adaptation of method to individual differences, adaptation of method to size of class, instructional materials, application of a general method to a particular school subject. Curriculum investigations including studies of objectives, studies of class size and the effect of sectioning classes, and accounts of the construction of tests were not included. Studies of learning in the field of the psychology of a school subject also were not included unless there were obvious implications in regard to methods of teaching.

The Committee also adopted a restricted definition of research. Descriptive accounts of teaching were not included and, in general, informal investigations or service studies have been omitted or mentioned only incidentally.

The restrictions just noted resulted in the elimination of a large number of the references that are commonly included in a bibliography on

the teaching of a school subject. Professor Blackstone reported that he examined approximately eight hundred references and found only forty which seemed worthy of inclusion. A few of these were not used in preparing the summary. None of the other cooperating specialists reported the number of references examined, but in several cases a definite attempt was made to locate all worthy published researches. It is apparent that much less real research has been carried on in the field of special methods at the high-school level than many of the published bibliographies indicate.

The relatively small number of researches in the several fields and their fragmentary character will probably suggest to many readers that the field of special method at the high-school level has been neglected by research workers. This may be true, but a critical analysis of the experimental technic reveals difficulties which seem unsurmountable. Theoretically, the determination of the relative merits of comparable instructional procedures seems possible; but when the control of non-experimental factors and the measurement of achievement are considered, precise evaluation is seldom possible. Usually the investigator is justified only in asserting that under the conditions of his experiment certain results were secured. Any generalization must be qualified, sometimes so extensively that it has little or no application.

Committee:

H. R. DOUGLASS,
CARTER V. GOOD,
WALTER S. MONROE, *Chairman.*

CHAPTER I

Mathematics

WHILE there is a relatively large number of quantitative studies of methods of teaching mathematics at the secondary-school level—grades seven through twelve—the very large majority of these are subject to fairly serious limitations, usually with reference to one or more of the following points:

1. Failure to employ reliable and valid means of measuring achievement.
2. Failure to equate adequately experimental and control groups.
3. Failure to furnish measures of variability in addition to measures of central tendency.
4. Failure to employ available means of measuring statistical reliability of differences.
5. Failure to control or to allow adequately for the influence of extra-experimental factors.
6. Employment of too few pupils in the experiment.
7. Employment of too brief an experimental period.
8. Employment of groups of students apparently not representative, or the representativeness of which was not adequately studied.

The majority of the more than two hundred studies examined are hardly worthy of mention here. Some of those mentioned are not free from criticism on one or more of the points enumerated above. Those in which most reliable technics were employed will be reviewed in somewhat greater detail.

Supervised Study

The greatest amount of most careful experimentation has been done in connection with evaluating various plans of supervised study. The earliest of these studies was reported by Breslich and by Minnick. In Breslich's (**3**, 1912)¹ investigation, one group in beginning algebra worked under supervision with no homework, while the other had homework with no supervision. No effort was made to pair the pupils and the time of the experiment was only one month. Achievement was tested by means of tests covering the material studied. Both classes accomplished the same amount of work within the regulation time. The supervised group, the weaker section at the beginning of the experimental period as judged by scores at the end of the first semester, came out stronger after nearly three weeks of supervised study and proved to be still stronger during the last week of the experiment when they took homework while the other group worked under supervision.

¹ The bold face number in parenthesis denotes the number of the reference in the bibliography at the end of this review. The light face figures indicate the date of publication.

Minnick (25, 1913) studied two groups in plane geometry of eighteen pupils each. Equivalent groups were formed on the basis of the average of their algebra marks for three semesters. There was a slight advantage in favor of the unsupervised group. He found that in each of the two six-week examinations and the final examination the supervised class excelled in both average mark and average number of problems solved. In each of the four remaining tests the average of the supervised class was decidedly better than that of the unsupervised class.

In an effort to evaluate by objective methods the results of the divided-period method of supervised study in a small high school, Jones (22, 1927) divided a class in beginning algebra into equivalent groups of fourteen members each and measured the progress of each group by the *Hotz Algebra Scales* and the *Douglass Standard Diagnostic Algebra Tests*. The entire class met in the regular classroom for thirty-five minutes immediately before the lunch hour. After lunch the experimental group met in the regular classroom for thirty-five minutes of supervised study. The control group was assigned to the general study room for the same time. This plan was used during the entire year. Jones concluded that (a) a divided period of recitation, followed by study under supervision of the teacher, produces greater efficiency in algebra than study without direction; (b) the better pupils profit by supervised study but not to so great an extent as the poorer pupils do; (c) classes using supervised study in algebra do more uniform work than classes under the recitation period.

An investigation of the comparative merits of supervised study and the common types of recitation as methods of instruction was reported by Brown and Worthington (4, 1924). In each cooperating school two classes were organized in some subject such as algebra, these two classes to be composed of pupils of as nearly equal ability as possible. The ability of the members of the class was determined by means of intelligence tests or other objective measures. One class met daily for a class period of sixty minutes in which the supervised-study plan was employed. The other class met for a class period of forty-five minutes in which the usual recitation was used. Both classes were taught by the same teacher. Instructions were sent to each teacher describing explicitly the type of supervised study that he should employ. The progress of each group was measured by means of tests given at the beginning, during, and at the end of the experiment and by means of teacher's marks. In order that the teachers might be thoroughly acquainted with the supervised plan, they were referred to a selected bibliography on the subject.

In all, seven pairs of parallel classes in four schools were considered in this investigation. Two of these were pairs of 9A algebra classes.

Teacher's marks were employed with one pair to determine the relative ability of the members of the classes and progress made by the classes. As indicated in Table 1, no appreciable difference was discovered.

In the other school, where the groups were equated on the basis of *Terman Group Intelligence Test* scores, the supervised-study group showed marked superiority over the recitation group. In the *Hotz Equation and Formula Test*, which was given after six weeks and again after eighteen weeks, the supervised-study group raised its median score 35 percent, while the recitation group raised its median mark only 26 percent. According to the instructor's marks, the best results were obtained in the supervised-study class. There were ten failures in the recitation group as compared with four in the supervised group.

In the schools and classes represented in this investigation, the principals, teachers, and pupils generally believed that supervised study, as a means of instruction, is productive of better results than the common types of recitation and unsupervised study.

Douglass (11, 1928; 12, 1927) carried on a carefully controlled experiment for eleven weeks in order to secure some reliable quantitative data on the question of the relative effectiveness of two sequences in the administration of supervised study: (a) the study-recite plan, and (b) the recite-study plan. He employed three paired sections of pupils in the University of Oregon High School, one pair in each of the three years of junior high-school general mathematics. The pupils were paired on the basis of chronological age, composite intelligence, and mathematical test scores. Every effort was made to hold constant or to equalize every significant factor likely to affect the progress of the two sections, except the experimental factor—the difference in sequence of study and recitation.

Tests were administered at the beginning and at the close of the experimental period as a means of measuring the relative progress of the two sections of each pair. The tests for the seventh and eighth

TABLE 1—COMPARATIVE RESULTS IN SCHOOL A (BROWN AND WORTHINGTON)

| Algebra 9A | Number of pupils in class | Median mark before experiment | Median mark after experiment | Number of failures |
|------------------------------|---------------------------|-------------------------------|------------------------------|--------------------|
| 1 | 2 | 3 | 4 | 5 |
| Recitation group | 23 | 91.1 | 87.5 | 6 |
| Supervised study group | 24 | 90.6 | 86.9 | 4 |

grades, constructed by the head of the mathematics department under the supervision of the author, were objective and tested only that part of the year's work covered during the experimental period. For the ninth-grade sections the *Douglass Standard Diagnostic Algebra Tests* were used. Although the differences in mean gains were relatively small, especially that for the eighth grade, all of them favored recite-study sequence. Neither sequence was found to be peculiarly favorable for the more capable or for the less capable student.

Hefferman (19, 1928) conducted an investigation in order to study the comparative effect of the "Morrison plan" of supervised study and the traditional recitation plan in plane geometry. Two groups, consisting of three classes each, were equated on the basis of the *Otis Tests of Mental Ability*. There were seventy-six in the experimental group and eighty-one in the control group. For eight weeks the three experimental classes were taught according to the Morrison formal steps and the three control classes were taught according to the traditional recitation plan. Achievement was measured by ordinary class tests. The length of the recitation period, the basic text, time spent upon the study, and materials selected were the same for both groups. The differences in median scores on the three class tests favored the Morrison technic by a margin of from 3.5 to 6.1 times as great as the standard deviation of the respective differences.

Hare (18, 1925) attempted to discover whether or not better results in the mastery of subjectmatter could be obtained by supervising the study of the pupils during the class period. Two classes in plane geometry in the Grandview Heights (Ohio) High School were used. The control class was assigned small units of work to be prepared outside of class time and daily tests were administered to determine the completeness of their preparation. To the experimental group larger units of work were assigned, the pupils doing a large part of their work in class under the supervision of the teacher. The classes were not equated. The work covered, preliminary tests, final tests, teacher, and length of class period were all the same. The results were inconsistent. One test and the average of class marks showed a greater gain for the section having supervised study. The other test and the average of the semester examinations indicated superior gains by the control section.

Mason (24, 1930) made a comparison of the contract-assignment plan of supervised study and the daily-assignment and recitation method of instruction. Ninety-five pairs of pupils in English, civics, American history, seventh-grade arithmetic, biology, and algebra were used. In each subject the teacher taught one class on the contract plan and one class on the recitation plan. Two sections in ninth-grade algebra were involved, and the conclusions were based upon gains made during the experimental period by eleven pairs of students in

these sections as measured by the *Hotz Algebra Scale*. The gains of the control group in addition and subtraction, in graphs, and in problems were superior to those of the recitation group, the ratios of differences in mean gains to the standard deviations of the differences being 2.1, .8, and 1.5, respectively. With respect to equation and formula, and multiplication and division, there were smaller differences in mean gains in favor of the recitation group, the ratios of difference to the standard deviations of differences being .6 and .5, respectively. Thirteen pairs in two seventh-grade arithmetic classes were studied and gains measured by an informal objective test. The difference in mean gain was in favor of the contract group and was 1.3 as great as the standard deviation of the difference. Apparently, therefore, the contract method was probably slightly superior to the recitation method in these mathematics classes.

In an experiment under uncontrolled conditions Luccock (23, 1923) compared the results obtained in a double-period class in geometry with those obtained in the ordinary single-period class. Tests on propositions did not show much difference between the two classes, but the double-period class did much better on the exercises and greatly exceeded the single-period class in tests on exercises taken up as classwork from day to day.

On the whole the better controlled experiments in this group rather uniformly indicate small differences in favor of supervised study. In those instances in which experimenters report that decidedly better results are obtained under supervised study one must take into consideration the small numbers involved, lack of control of non-experimental factors, and failure to measure results by objective tests. It seems that supervision is not as beneficial for the brighter students as for the poorer students, and in some instances it was found that the progress of the bright student was retarded.

Problem Solving

Barton (2, 1926) compared the group-discussion method with the individual-assignment method in developing ability in problem solving in ninth-grade algebra. Two groups of eleven each were equated on the basis of chronological age, and I. Q. factors such as sex, course of study, and initial accomplishment were controlled. Both classes were taught by the same teacher. *Stevenson's Problem Analysis Test, Form I*, was given at the beginning of the experiment and *Stevenson's Problem Analysis Test, Form II*, and *Hotz Problem Tests, First Year Algebra Scales, Series A*, were given at the end of the experiment. Although recognizing the small number of pupils with which the experiment dealt, the experimenter concluded, at least tentatively, that the group-discussion method of teaching problem solving in first-year algebra to

pupils normal or above the average in intelligence is superior to the individual-assignment method. The differences between mean scores of the three tests average about as great as the standard deviation of the difference.

Chastain (7, 1925) investigated the relative effectiveness of the following types of geometry assignments:

Type 1. A carefully planned, analytical assignment, consuming about fifteen minutes of time, in which pupils participate in outlining:

1. What is given?
2. What is to be proved?
3. Given certain facts, what others follow?
4. Of the facts known, which can be utilized in reaching the desired end?

Type 2. An assignment made by the "proposition and exercise number type," consuming about one minute of time.

Two groups of fourteen first-year geometry pupils were paired on the basis of intelligence test scores. The experiment was conducted for a period of eighteen weeks and precautions were taken to secure control of non-experimental factors. The difference in mean scores of all nine tests administered during the experiments significantly favored the Type 1 assignment.

Johnson (20, 1924) compared the relative effectiveness of the use by students of geometry of a technic of thinking with the usual method of teaching geometry. Two control groups of twenty-five pupils each were so selected that the medians of intelligence tests were lower for that group than for the two experimental groups of the same numbers. The experimental periods for the two pairs of groups were thirty-six and eighteen weeks, respectively. Both median and mean scores on the final examination, which was constructed so as to test ability to offer original proofs of theorems, favored the experimental group. Differences in mean scores on the Burt reasoning test, given at the beginning and at the conclusion of the experimental period, indicated a slight spread or carry over to a more general field of activity. The difference, however, is too small to be significant.

Ford (13, 1927) made an attempt to ascertain if "suggesters" actually aided pupils to solve original problems. The suggesters consisted of a readily recallable and suggestive group of words or a single word, each letter of which suggests a line of thought or process. The experimental and control groups of unreported size used in this experiment had the same median score on the *Rogers Battery Test* at the beginning of the experiment. Achievement was measured by *Minnick's Geometry Test C*. The conclusions favored the use of "suggesters" in stimulating and directing pupils in the solution of original problems.

With groups of thirty pupils equated on the basis of C. A., M. A., I. Q., and on a composite test in reasoning, Perry (31, 1925) conducted a much more carefully controlled experiment lasting an academic year

to determine the effects of using a technic in reasoning. A detailed statement of the technic was mimeographed and a copy given to each student in the experimental division. It was the purpose of this technic to bring about (a) a decrease in the difficulties of the students in their grasp of the notion of proof in the solution of exercises; (b) an increase in their ability to reason through continuous practice in the solution of exercises; and (c) increased confidence of the students in their own ability to reason through successful achievement "versus perplexing failures." The method of instruction in the control divisions was that of question and answer based upon previous assignment with the emphasis directed toward increasing the number of correct responses to the subjectmatter. Matching, multiple choice and true-false exercises, and three tests of exercises of graded difficulty were used to measure achievement.

Perry found that the effect of this technic in reasoning upon the experimental division as a whole was to increase the ability to respond successfully to the solution of exercises in geometry in spite of the fact that the student abilities of the experimental divisions were less than those of the control divisions. She also found that training in the reasoning technic proved helpful to the group of average students, of slight benefit to superior students, and detrimental to the group of very superior students in initiating and developing habits of analysis and generalization. The ability to solve problems non-mathematical in character was markedly improved. That her results are most probably not due to chance errors of sampling may be inferred from the reported ratios of differences in favor of the experimental groups to the standard deviation of the respective differences, ranging as they did from .9 to 3.3 with a central tendency between 2.5 and 3.0.

Pitts and Davis (32, 1931) attempted to measure the relative efficacy of the "analytic" method of teaching theorems in geometry as compared to the "conventional" method. The analytic method is described as one which involves working backward from the theorem which is to be proven to the basic axioms or theorems, placing all steps necessary in the proof of a theorem in major or minor columns and showing support for each statement. Two groups of thirty-seven and thirty-two pupils each were employed. These groups were not paired but were of approximately equal mean I. Q. Two teachers of supposedly equal training, experience, and ability were in charge of the sections. The experimental period was approximately eight months. Three locally constructed geometry tests were employed. As measured by gains in terms of percents of possible gains, two of these favored the conventional or synthetic method by substantial margins. The other favored the analytic method by a slight difference. The authors conclude quite definitely in favor of the synthetic method.

A comparison of two methods of arithmetic problem analysis was made by Clark and Vincent (8, 1925) who subjected the conventional method of analysis and a method of "graphic-analysis" to comparative experimental studies employing eighty pupils of the seventh and eighth grades of the Lincoln School of Teachers College. Pupils of the two sections were equated on the basis of test scores on reasoning ability and intelligence tests. While the experimental period was but six days the authors felt that they were justified in concluding that many pupils solve problems without resorting to the conventional method of analysis, and that the results of the graphic method are considerably superior.

Hanna (17, 1930) compared experimentally the merits and defects of three methods of arithmetic problem solving. The three methods used were (a) the dependencies (graphic); (b) conventional formula (4 steps); (c) individual (absence of any formal method). The experiment was carried on with twelve seventh-grade classes in two public schools and one private school in New York City. The groups were equated on the basis of four standard arithmetic tests. The experimental period was six weeks. The greatest gains were made by pupils using the individual and dependencies methods. The chances are ninety-six in one hundred that the superiority of the dependencies method and ninety-nine in one hundred that the superiority of the individual method to the conventional formula method were not attributable to chance errors of sampling.

Mitchell (26, 1929) sought to discover to what extent pupils, after solving a certain specific problem, are able to formulate a general conception whereby the principle involved in solving the problem will become generalized and thought of as applying to all problems of a similar nature. The experiment was carried out with two classes of thirty pupils each in the seventh grade and two classes of thirty-five pupils each in the eighth grade. He concluded that the fact that a pupil can solve a specific problem does not necessarily mean that the pupil has formed a general conception which he will apply to all similar problems. Problems with definitely expressed numerical quantities seem to be more readily understood and solved than problems of a general nature involving general principles. He suggested that some drill in problems of a general nature be given or that frequent application of the principle involved in the specific cases be made.

Diagnostic Testing and Remedial Teaching

Scott (34, 1927) attempted to determine the relative efficiency of three different methods of instruction for removing failures in algebra as revealed by diagnostic tests. Three groups of students in the first half of their second year in algebra were selected on the basis of *Hotz Algebra Scale* scores. A different method of remedial instruction was

used in each group. In Group I all papers were returned with the incorrect problems marked and the errors discussed in class. In Group II the papers were returned with problems marked wrong but there was no discussion of errors in class. In Group III no papers were returned and only questions were answered when the problems were too difficult for the students to work. The investigator concluded that diagnostic testing with remedial teaching on the particular weaknesses brought out by these tests resulted in a decided improvement in achievement. The method of returning all papers with errors corrected and showing the student the right and wrong method of procedure was found to be the best method of instruction. The greater the amount of time spent in remedial teaching the greater the amount of improvement shown.

Greene and Lane (14, 1929) described the use of new type tests in plane geometry which are not merely survey tests but are to be used as specific guides to teachers in adjusting the instruction to the needs of individual pupils. They also described the method of determining the reliability of these tests.

Guiler (15, 1929) reported favorably the results of an experiment to measure the effects of a twelve-week remedial program conducted with ten pupils in the eighth grade who received special remedial instruction. The group and individual needs of those below norm were diagnosed and remedial instruction planned to overcome these pupil difficulties resulted in a marked improvement, though pupils varied greatly in the amount of individual improvement.

Brueckner (5, 1928) reported a study dealing with diagnostic and remedial work in decimals with 300 pupils in the sixth, seventh, and eighth grades of the Minneapolis schools. Detailed tables were presented showing the particular difficulties encountered by pupils in decimals. In these tables the difficulties were classified according to process and appropriately listed. The data in these tables furnished an excellent basis for diagnostic work by any classroom teacher.

Chase (6, 1929) arrived at the following conclusions not completely substantiated by objective data. The principal causes of difficulty in solving verbal arithmetic problems are (a) insufficient mastery of the fundamentals; (b) inability to tell which process to apply in solving verbal problems. Other causes are improper reasoning habits, faulty reading, weak comprehension, lack of training in estimating answers, lack of organizing power or ability to do consecutive thinking, lack of capacity or training in inductive reasoning, short attention span, lack of initiative and self confidence. Students given remedial instruction made gains equivalent to from one to two years on standard tests.

Stone (38, 1930) found that by the use of his diagnostic and practice tests in the public schools of Spokane, Tacoma, Millwood, and Pullman, Washington, and Bend, Oregon, greater gains in the ability

to reason in arithmetic were produced than by the regular work in arithmetic that the tests may have displaced in classroom use. Control and experimental groups were formed in each school. These groups were equated on the basis of *Stone Survey Arithmetic Test* scores, mental age, chronological age, and school grade. The data indicated that the gain in reasoning ability obtained by use of these tests tends to transfer to reasoning demanded by other problems of different content, though of similar nature. This transfer is greater than the transfer obtained by an equivalent amount of regular arithmetic work. The greatest gains and greatest amounts of transfer were made by pupils possessing the highest I. Q.'s.

As a result of giving tests to six hundred pupils Dickinson and Ruch (10, 1925) concluded that it is imperative that much practice be given in simple factoring with subscripts; that additional attention to the use of decimal coefficients is very necessary; and that factors with upper- and lower-case letters should be introduced since they are common in applied mathematics.

Individual Instruction

Smith (35, 1927) undertook to evaluate the relative merits of individual and class instruction. The individual instruction was according to the Winnetka plan. The groups were equated on the basis of age, sex, and *Terman Group Intelligence Test* scores. The *Illinois Standardized Algebra Tests* were given as initial and final tests to measure progress of the two groups. The mean scores of the two groups were 18.5 and 13.8, a difference of 4.7 in favor of the conventional class method plan. However, due to the small number of pupils involved and the large variation in gains, this difference is but .33 of its standard error. Thus there is considerable doubt as to whether the apparent superiority might not have been due to chance errors of sampling.

With a much larger number of algebra pupils, Stokes (37, 1931) found the advantage in favor of individualized instruction on a modified Winnetka plan as compared to group instruction on a modified Morrison mastery plan. Three pairs of class sections involving 112 pupils were employed. Pupils were paired on the basis of intelligence, test scores, chronological age, and previous knowledge of algebra and arithmetic. As measured by reliable, specially constructed tests over large units of instruction, the superiority of the individualized method was sufficiently great to remove all question of its being attributed to chance errors of sampling, the difference being in each instance at least three times as great as the standard error of the difference. Not only did the pupils being instructed on the individualized plan seem to learn more but they completed the course of study in the various units in less time. The ratio of retention at the end of three-month and twelve-month intervals to measured progress during the experimental

period was approximately identical for both groups; the average amount lost was approximately 25 percent for each group at the conclusion of each period.

In an earlier and less carefully controlled experiment Stokes (36, 1927) applied the experimental test to the modified Winnetka method and the traditional group recitation plan. He reported that as measured by the *Hotz Algebra Scales* and the *Douglass Diagnostic Algebra Tests*, individualized instruction yielded definitely better results for classes theoretically equal in ability. Normal pupils under individualized instruction not only made better showing on the tests but were able to do it in less time. The results also showed that the slow pupil can learn algebra if instruction is individualized and adapted to the learner.

Moore (27, 1929) undertook a comparison between the relative effectiveness of an individual method and a recitation method of teaching geometry and algebra. Pupils were paired on the basis of chronological age, a composite score made up of intelligence score and mathematical ability score, and the results of the initial tests in the subjectmatter. The experiment continued for eighteen weeks in geometry and for twelve weeks in algebra. The results apparently demonstrated that the individual plan of study and work in geometry is superior to the recitation plan. Neither method was decidedly superior for the bright student, although as far as geometry was concerned a slight trend in favor of the contract plan for the bright student was evident. As far as algebra was concerned, the individual and recitation methods yielded approximately equivalent results. Neither method in algebra was significantly superior to the other for the bright student or for the slow student.

Newcomb (29, 1925) attempted to discover the extent of supplementary and optional work which would be accomplished by pupils when they are given opportunity and encouragement. The experiment was conducted in the seventh and eighth grades of the training school of the State Teachers College, Ada, Oklahoma. Definite assignments were made in the basic text and optional assignments in the supplementary text. The results showed that an average of 130 extra problems was completed by eighth-grade pupils, and an average of 57 extra problems per pupil in the seventh grade. Extra drill enabled the pupils to make better records in connection with the standard tests as revealed by the scores made before and after the period of supplementary work.

Value of Drill

Coit (9, 1928) reported a study in which the value of drill in developing mastery of fundamental processes of algebra was investigated. Simple algebra tests involving the fundamental operations were given

in four high schools in Seattle, including ten sections of algebra. Drill exercises in subtraction were prepared and sent to the teachers with instructions to drill half the sections that had taken the first test. After one hundred minutes of drill the sections were retested. After a lapse of two months a second retest was given. There was no drill between the first and second retests. In all four schools there was a marked decrease in the percent of failures in the first retest and the effects of the drill were still evident after a lapse of two months. The sections not drilled were also retested but the decrease in the percent of failures was much less than for the drilled sections.

Armstrong (1, 1928) also conducted a controlled experiment for the purpose of evaluating the effectiveness of drill in algebra. The control and the experimental groups were paired on the basis of I. Q.'s. The experimental group was given eight minutes of drill from three to five times a week for seven months. The control group had no drill. As measured by the gains on the *Hotz Algebra Scales* the experimental group showed a 12 percent advantage over the control group. The experimental mean difference was approximately 1.1 of the standard error of the differences.

The primary purpose of Taggart's experiment (39, 1918) was to determine the efficiency of review tests in algebra similar to the *Courtis Standard Practice Tests in Arithmetic*. Two experimental groups were given review tests similar to the Courtis tests. The control group, which apparently was not matched with the experimental sections, did not take the review tests. On the basis of scores on tests devised for the purpose of this experiment, the author ventured the conclusion that the review tests increased the efficiency of the pupils in their regular work.

Newcomb (28, 1925) reported an experiment which was conducted with seventh-grade drill and non-drill groups in arithmetic, extending over a period of thirty-five days. The drill group evidenced a superior improvement in speed and accuracy in fundamentals and also in the solution of reasoning problems. He also concluded:

(a) That systematic and proportionate drill upon combinations with higher decades, so universally neglected, as well as upon the fundamental combinations, affords a type of drill which will yield excellent results; (b) that drill upon combinations of "seen numbers" with "thought numbers" is a valuable method of drill, especially in preparation for column addition; (c) that special drill upon difficult combinations or an over-drill upon certain ones is to be desired; (d) that the particular method of drill used, while not all-sufficient, is economical of time and effort for both teacher and pupils in providing the type of drill indicated and in bringing about accomplishment of desired results.

Miscellaneous

In 1925, Haertter (16, 1928) at the University High School, University of Minnesota, launched an experiment in geometry that was to run two years; the first was to be spent in trying out various teaching

technics which are best adapted to large classes and small classes; the second year was to be devoted to controlled experiments in which the most promising method for each class was to be used. However, he carried out only the first year of the experimental program because he accepted a position elsewhere. The feature of his large class technic was the breaking up of the class into groups of nine pupils under the leadership of a strong pupil. From time to time he would call them together and clear up their difficulties. He occasionally met with the class leaders by special arrangement to consider ways and means of making their leadership most effective. Each pupil in the smaller section was paired with two pupils in the larger one on the basis of freshman marks in English, general science, and mathematics, and average I. Q. on six intelligence tests and on Stanford-Binet mental age. The median score of the small class was 562; that of the twenty most closely mated pupils in the large class was 557.5; and that for all the large class was 552.5. The advantage of the large class was for the weak students. The large class proved better for the mediocre students. For the brighter pupils class size made no difference. Miss McGuire, a colleague of Haertter, took up the experiment in the fall of 1926. She too found that students of more or less than average ability did equally well while those of average ability excelled in the large class.

Nick (30, 1929) compared a workbook with a textbook as material of instruction in first-year algebra. Two classes of thirty-two pupils each were equated on the basis of age, sex, and mental ability as measured by certain group tests for this purpose. Every effort was made to keep the conditions of instruction constant for both groups. The control group studied a standard and widely used textbook in algebra. The experimental group used a workbook in algebra. This workbook purported to be a basic text and did not require the use of any other materials. The experimental period was one semester. Home-made objective tests, with reliability ranging from .86 to .98 on each unit of work studied, *Hotz Standardized Algebra Tests Scales, Series B*; *Douglass Standard Diagnostic Test for Elementary Algebra, Series A, Form I*; and the *Illinois Standardized Algebra Tests* were used to test achievement during the experimental period. The conventional statistical constants were computed from the data for each group. On four of the thirteen tests the two groups were practically equal. The scores on the remaining nine tests showed an advantage in favor of the workbook group. In terms of units studied, the results of the testing showed that the achievement of the groups may be considered equal on two of the units, namely, Unit I, literal numbers; and Unit VI, multiplication. On the remaining five units—directed numbers, addition, equations, subtraction, and division—the achievement of the experimental group was considerably higher than that of the control

group. On the nine tests in favor of the experimental group the chances ranged from seventy-two to ninety-nine in one hundred that the differences are not due to chance errors of sampling.

Using two unequated groups Scofield (33, 1925) made a comparison of two methods of teaching geometrical concepts. Two experimental sections of pupils were taught the geometric concepts by placing the figures on the board. From the general class discussion the pupils were assisted in working out their own definitions. The control groups studied the definitions from the textbook. The technical concepts involved were compared with the general and colloquial uses of the terms. Although the data are meager the author concluded that the experimental method has given the pupils clearer concepts, a keener interest in geometry, and a better approach to demonstrative work than has the traditional method.

With an experimental period of a semester Johnson (20, 1924) compared the ordinary question and answer type of recitation with the socialized project method in correlated mathematics in the ninth and tenth grades. He employed four groups, a control and experimental section for each year. The two ninth-year classes represented approximately the same degree of intelligence with similar dispersion of scores. In the case of the two tenth-year classes the median was the same but there was a greater dispersion for the control group. Johnson says that this discussion merely suggests a technic which on the basis of objective and impartial experimentation has given indication of at least partial success in the case of mathematics.

CHAPTER II

Physical and Biological Sciences

STUDIES under this chapter topic will be reviewed under the following sub-headings: Lecture demonstration versus laboratory work, unit assignments, visual aids, drawing in connection with laboratory work, reporting laboratory exercises, general plan of instruction, sequence of laboratory and classroom work, and miscellaneous.

The Lecture Demonstration versus Individual Laboratory Work

Wiley (108, 1918) reported a relatively crude experiment in which he found the lecture method, as he applied it in teaching chemistry, inferior to both the laboratory method and the textbook method. Since the experiment involved three groups of only eight pupils each and extended over a period of only three lessons, the findings cannot be considered very dependable. Phillips (97, 1920) in physics and Cunningham (60, 1920) in botany reported two more relatively crude experiments favorable to the lecture-demonstration method.

Since 1923 twelve other experiments on the high-school level have been reported—Coopridge (58, 1926) and Johnson (81, 1928) in biology; Cunningham (62, 1924) in botany; Anibel (41, 1926), Carpenter (54, 1925), Horton (74, 1928-30), Knox (84, 1927), Nash and Phillips (93, 1927), and Pugh (99, 1929) in chemistry; and Dyer (67, 1927), Kiebler and Woody (82, 1923), and Walter (106, 1930) in physics. Superiority was reported as follows: biology, lecture-demonstration, but the difference probably is not statistically significant; botany, lecture-demonstration when relatively complicated apparatus is used and when immediate retention is measured; chemistry, lecture-demonstration was favored in three of the experiments, individual laboratory in one, and approximately equal effectiveness was shown in two of the six experiments, but none of the reported differences is highly significant; physics, lecture-demonstration, but the difference is small. Colton (55, 1925) reported no significant difference in the effectiveness of laboratory work with a large number of demonstrations and lectures and of laboratory work with a small number of demonstrations and lectures. His experiment was conducted with college students in zoology. The experimental technics used are open to serious criticism. Lecture-demonstration appears to engender informational abilities when tested immediately, as well as the individual laboratory method; but when retention of information is tested some

months later the differences favor consistently, but not with high statistical significance, the individual laboratory method.

The fifteen studies whose findings have been summarized are not identical in plan, and several somewhat incidental conclusions have not been mentioned because of the limitations of space. As a means of illustrating the technics employed, the experiment by Horton (74, 1928-30), one of the better ones, is described briefly. After rather elaborate preliminary experimentation this investigator set up nine groups, varying in size from 26 to 128 pupils, approximately equivalent with respect to mean and standard deviations on the mid-term examination in chemistry. He then applied the following experimental factors (one factor to each of the nine groups):

Regular instruction for twenty weeks with one day per week individual laboratory work, in which the pupils followed directions from mimeographed books.

Teacher demonstration one day per week for twenty weeks.

Individual instruction with directions for the first ten weeks, followed by teacher demonstration for the last ten weeks.

Problem method all term (twenty weeks), individual laboratory work but without directions—oral or written.

Problem method for the last ten weeks, regular method for the first ten weeks.

Regular method with "generalization" and study of drawings of typical apparatus for preparing substances with known properties.

"Control group" for second term continued throughout the first and all of the second term by regular instruction with printed directions in the laboratory work.

"Teacher demonstration" during the last ten weeks of the second term (previously regular).

"Problem method" without printed or other directions for laboratory work during last ten weeks (previously regular).

The gains in achievement were measured at the close of the term "by tests designed to measure: (a) ability to manipulate apparatus and meet standards of technic; (b) ability to solve problems involving chemical situations and presumed to require scientific thinking; (c) ability to answer in writing questions involving information about and comprehension of chemistry and chemical principles." The differences in achievement as measured by the written tests, while not statistically significant, are favorable to the individual laboratory method. The differences in achievement as measured by the tests of laboratory abilities are statistically significant and favor the individual laboratory method. Horton summarized his findings as follows:

The order of preference of the methods studied, in the light of all the outcomes measured, appeared to be:

1. Individual laboratory work *without directions*, the so-called "problem method."
2. Individual laboratory work following directions, with these directions consciously generalized.
3. Individual laboratory work following directions from a manual—the regular method of previous practice.
4. Demonstration of all experiments by the teacher.

The investigator is to be commended for preliminary experimentation, for comparatively large equivalent groups, for precise definition

and experimental factors, for measurement of laboratory skills, and for an attempt at measurement of the interests pupils acquire with respect to the methods. It is unfortunate that no measurement was attempted of attitudes, ideals, and abiding interests with respect to chemistry, possibly more effectively engendered by laboratory work rather than by lecture-demonstration instruction. The conclusions of this experiment appear to be fairly dependable. It should be noted, however, that even these conclusions are limited in dependability because of possible failure to control such important non-experimental factors as the zeal and skill of the teachers and because of failure to measure all the outcomes of laboratory and lecture-demonstration instruction.

Although most, if not all, of these experiments are subject to certain limitations, the consistency of the findings probably justifies the conclusion that demonstration lectures by a skillful instructor are satisfactory substitutes for a considerable portion of the usual individual laboratory exercises.

The "Unit" Type of Assignment

Several varieties of the "unit" type of assignment have been applied in the field of science. Allen (40, 1914), Beauchamp (46, 1923-25), Broom (50, 1926), and Porter (98, 1927) reported evidence that the particular plans they used are at least reasonably effective, but none of them contribute adequate comparative data. Corbally (59, 1930) attempted to determine the relative effectiveness of the assignment-recitation plan and the "Morrison plan of mastery technic." When the plans were judged on the basis of immediate retention there was no significant difference between the two types of assignment. When the pupils were tested one month after the completion of a unit, the data favored the Morrison plan. Corbally says: "The determining factor is the teacher, not the method or device." Frederick (70, 1926-27), Garber (71, 1922), Hurd (79, 1925-26), Miller (90, 1930), and Watkins (107, 1923-24) experimented with certain types of the project method. Frederick (70, 1926-27) compared the effectiveness of the "text-study-recitation method" and the "project-activities-socialized" or opportunistic method of teaching general science. He used two groups of about sixty pupils each which were approximately equivalent with respect to several traits and measured achievement in terms of health and health behavior. He reported a statistically significant difference in favor of the project-activities-socialized method. Hurd (79, 1925-26) conducted an experiment with the project method in high-school physics; and while his conclusions favored the project method his data might, with considerable justification, be given an interpretation in favor of the assignment method. Miller (90, 1930) investigated the relative effectiveness of the "topic discussion" and

"individual project" methods of teaching high-school physics. He reported that both methods are of approximately equal effectiveness so far as the achievement measured by his informal tests was concerned, but that the project method appeared to arouse greater interest on the part of the pupils. The complexity of the experimental factors and the failure to secure adequate control of important non-experimental factors, particularly the zeal and efforts of the teachers, render the conclusions of the above experiments of doubtful dependability.

The Use of Visual Aids

Sumstine (104, 1918) reported an experiment in which he found presentation of subjectmatter relative to the use and production of dynamite by moving pictures superior to presentations by lecture and by moving pictures in combination with a lecture. Rolfe (102, 1924) compared the relative effectiveness of presenting the topic "static electricity" through motion pictures and through teacher demonstration. Achievement was measured, not only by means of a test of twelve questions, but by observation of the success with which the pupils repeated the experiments in static electricity which had been demonstrated to them. His findings were decidedly favorable to the demonstration by the teacher. Lemon (86, 1921) found the presentation of the topic of magnetism by a demonstration-lecture more effective than a moving picture of the same topic. Hunter (76, 1918-22) compared visual and oral instruction in biology; the results indicated the superiority of the latter procedure. Brown (52, 1928) found still pictures more effective than moving pictures. Huebner (75, 1929) used models, teachers' drawings, and charts and found their relative effectiveness to be in the above order. All of these experiments were subject to limitations and the results should be considered only as suggestive.

The Making of Drawings in Connection with Laboratory Work

In a carefully conducted experiment involving two groups of thirty-one students, Ballew (44, 1928) found no significant difference between the achievement in zoology of those who were required to make the drawings called for in fourteen laboratory exercises and that of those who merely located structures. In an experiment conducted by Taylor (105, 1930) with college freshmen in biology, the achievement of students required to label the parts of accurate, ready-made drawings was superior to that of the students required to make drawings. Both Ayer (42, 1916) and Bryson (53, 1921) concluded that diagrammatic drawings were more effective than carefully shaded, picture-like drawings. In addition to requiring more time, the making of picture-like drawings appear to distract the attention of students from the structure that was being represented. Coopridge (57, 1925) secured superior results when students in biology were required to

ink in drawings first made in pencil. It may be noted that going over a drawing a second time adds to the achievement of the students.

Methods of Reporting Laboratory Exercises ¹

The type of notebook report of laboratory exercises was studied in two experiments by Moore and Dykhouse, and by Curtis (92, 1929) and Stubbs (103, 1926). In the former, slight superiority was reported for a record restricted to "(a) a statement of the problem, (b) a series of labeled diagrams showing the various stages in the progress of the exercise, and (c) the conclusion." The data presented by Stubbs (103, 1926) favored the following instructions: "Write the notes according to (a) title, (b) materials used, (c) object, (d) procedure, (e) results, and (f) conclusions. Answer the direct questions in the manual."

In both cases the instructions in regard to notebooks which were compared seem to overlap to such an extent that it is difficult to interpret the findings. A possible interpretation seems to be that the notebook requirements should be flexible and should provide for resourcefulness and initiative on the part of the student.

General Plan of Instruction

Mayman (89, 1915) reported the following order of superiority for teaching physics in seventh and eighth grades: (a) experimental laboratory method, (b) lecture method (c) textbook method. On the basis of several experiments with classes in biology, Hunter (76, 1918-22) reported the "developmental method" ² to be superior to both the traditional textbook method and the lecture method. In a cooperative experiment participated in by sixteen teachers of general science, Klopp (83, 1928-30) reported that on the basis of final scores the lecture method was superior to both the textbook method and the "telling-demonstration method" in botany, and that the telling-demonstration method was superior in physics and zoology. Brown (51, 1929) reported data on the effectiveness of "cycle teaching" in science, and Quick (100, 1928) presented information on the value of individualized instruction in general science.

These experiments, especially those of Hunter and Mayman, do not appear to justify any generalization in regard to the relative merits of the plans of instruction compared. The experimental factor is so general that the application of any of the indicated methods in a particular case is likely to be influenced to a significant extent by the resourcefulness, zeal, and skill of the teacher.

¹ For a comprehensive study of present practices with respect to biology notebooks, see: Baird, D. O. *A Study of Biology Notebook Work in New York State*, Teachers College, Columbia University Contributions to Education, No. 400. New York: Bureau of Publications, Teachers College, Columbia University, 1929. 118 p.

² The method includes introduction of lessons as problems, encouragement of discussion, reference to experiences of pupils, and absence of formal lecturing.

The Sequence of Laboratory and Classroom Work

The sequence of laboratory and classroom work was studied in three experiments: Bagby (43, 1929), Greenlaw (73, 1930), and Parr and Spencer (95, 1930). Bagby (43, 1929) applied these sequences: (a) laboratory work first, (b) a preview of the topic and then laboratory work, and (c) thorough study before any laboratory work on the topic. No significant differences in achievement were found. In both of the other studies only two sequences were involved—laboratory first and recitation first. The cooperative investigation of Parr and Spencer (95, 1930) involved thirty-five classes, including a total of 857 students in chemistry. In those high schools where there were two classes, paired groups were formed on the basis of scholastic standing previous to the beginning of the experiment. In the smaller schools a rotation technic was employed. Detailed instructions were given to the teachers participating in the experiment which extended over a period of two weeks. The conclusions are as follows:

1. For the total population tested the "recitation first" method is somewhat superior to the "laboratory first" method of teaching.
2. For the pupils in equated groups of the upper quartile the "laboratory first" method shows a superiority in the immediate test and the "recitation first" method, a superiority in the delayed tests. Both methods seem to work about equally well for bright pupils. For students of the lower quartile the "recitation first" method gives better results.
3. For both upper and lower quartiles as well as for the total population, retention is greater following the "recitation first" method.
4. A teacher's preference for a method has an influence upon his success in teaching by experimental procedures.

The conclusions of Greenlaw's experiment (73, 1930), which involved two groups of sixty-one students each, agreed with those just quoted except that "in the lower quartile the loss or 'delayed recall' is greater for the 'recitation first' group than for the 'laboratory first' group."

The first conclusion of Parr and Spencer (95, 1930) is based upon a difference so small that its significance is doubtful, while the fourth conclusion is rather strongly supported by the data. These facts and evidence from a number of other investigations suggest that for a particular teacher that method is best which he prefers.

Miscellaneous

Beneficial effects from diagnosis and remedial instruction are shown in one single-group experiment, Malin (88, 1928), and in two reports of case studies, Bedell (47, 1929) and Loree (87, 1926). In a rather carefully controlled experiment Duel (67, 1928) compared the "even-front system" in laboratory work with a type of individualized instruction designated as the "rotation system" by means of which the

members of a class may be working on different exercises. The data secured indicated the superiority of the rotation system.

Riedel and Rule (101, 1929) compared the teaching of general science daily with teaching it on alternate days for the same number of periods. The differences in achievement were not significant. In a similar experiment carried on in the Denver public schools (64, 1929), there was likewise no significant difference in the achievement at the end of the teaching period, but the distributed learning resulted in superior retention.

Bowers (49, 1924), Noll (94, 1929-30), and Hurd (77, 78, 1929) investigated experimentally the influence of varying amounts of laboratory time in college chemistry and in human physiology on the college level. While Bowers (49, 1924) reported that two hours per week of work in the chemistry laboratory secured as effective results as four hours per week, Noll (94, 1929-30) concluded after extensive experimentation that the sections "having the greater amount of laboratory work showed consistent superiority in general achievement." The conclusions of the two experiments reported by Hurd (77, 78, 1929) in human physiology conflicted with each other. In one Hurd (78, 1929) makes the statement that "considerable evidence is indicated in favor of seven and one-half hours of laboratory work a week as contrasted with five hours of laboratory plus two and one-half hours of library work, at least as the latter plan was conducted." In the other experiment reported by Hurd (77, 1929) the students having five hours of laboratory achieved more than those having seven and one-half hours of laboratory. Failure to secure adequate equivalence of groups and to control important non-experimental factors renders the conclusions of Bowers (49, 1924), Noll (94, 1929-30), and Hurd (77, 78, 1929) of doubtful dependability. The chief criticism that may be made concerns the failure of these experimenters to equalize the opportunities, inside and outside of the laboratory, of the experimental and control students to learn the subjectmatter of chemistry and of human physiology.

Coopridge (56, 1922-23) reported two attempts to determine the relative effectiveness of demonstration with oral instruction, demonstration with written instruction, individual work with oral instruction, and individual work with written instruction. The second experiment, which is somewhat superior, resulted in the following conclusions:

Demonstration work should be given with oral instruction. Individual work should be given with written instruction. Individual work should be given in preference to demonstration work (if retention is the aim).

Oral instruction gives better results than written instruction, and demonstration work seems to be more effective than individual work (if immediate retention is the aim).

Hurd (80, 1929) reported an interesting experiment in the teaching of human anatomy to medical students. The problem was that of deter-

mining whether as effective results could be secured when four students dissect a cadaver as is secured when two students dissect a cadaver. The conclusions of this experiment reported that there was no significant difference in the achievement as measured.

In completing this summary of miscellaneous experiments on methods of teaching science the conclusions of several related studies may be briefly referred to. Bawden and Jackson (45, 1929) conducted a relatively crude experiment with college students in chemistry in which supervised study was the experimental factor. Their conclusions were favorable to supervised study. Similar conclusions were reported by Cunningham (61, 1922) for high-school chemistry students. Douglass (65, 1927-28) investigated the relative effectiveness of the study-recite and the recite-study sequences of supervised study in connection with high-school general science (and other high-school subjects). The conclusions of his carefully conducted experiment favored the recite-study sequence for general science. Persing (96, 1924) studied the effectiveness of paragraph summarizing as a procedure in learning high-school chemistry and reported it to be effective in increasing achievement. His experiment may be labeled "crude." Blank (48, 1930) reported differences in achievement favorable, but not significantly favorable, to the study-guide method of directing learning in high-school physics. Curtis (63, 1924) investigated the relative effectiveness of extensive and intensive reading of general science. His experimental factor was rendered more complex by his concomitant attempt to determine the effectiveness of the direct teaching of scientific attitudes. While his conclusions were decidedly favorable to extensive reading, the statement was made that "extensive reading of scientific literature contributes to the scientific attitudes of the individual but not to the extent secured by a small amount of class time devoted specifically to the teaching of scientific attitudes." Curtis' test of scientific attitude is an interesting aspect of the experiment.

In a pioneer experiment in the teaching of high-school zoology, Gilbert (72, 1910-11) reported slightly superior results for instruction in which the economic aspects of the subject were emphasized as compared with instruction where the pure science aspects of the subject received greatest emphasis. His findings are interesting but not dependable. Laton (85, 1929) sought to evaluate experimentally a method of instruction in high-school biology in which efforts were made to apply "principles of the psychology of learning, particularly those of interest, use, analogy, satisfaction, unidentifiable elements, and recency." Conclusions favorable to the method are undependable because of the complexity of the factors compared, poor control of teacher skill, small groups, short duration, and inadequate measurements.

CHAPTER III

Reading and Literature

ABILITY to read well was assumed formerly for all pupils entering secondary schools. Recent studies, however, of the reading achievements of junior and senior high-school pupils have revealed the surprising fact that many of them read no better than is normally expected of fourth- and fifth-grade pupils. A clear recognition of these facts has stimulated investigators to study such problems as the following: How can the reading achievement of poor readers be improved? What methods are most effective in reading-study activities in content subjects? How may comprehension and appreciation be increased in literature classes? In the paragraphs that follow the results of studies relating to these problems, which were published prior to July, 1930, will be summarized briefly. In addition, the results of studies relating to methods of stimulating the reading interests of pupils will be reviewed.

Methods of Improving the Reading Achievement of Pupils in Secondary Schools

The plan most frequently adopted in improving the reading habits of poor readers in secondary schools is to make careful preliminary studies of their achievement and then provide reading instruction adapted to their needs in either a special reading or a literature class. The procedure followed by Jacobson and Van Dusen (120, 1930) is typical. In preliminary tests of reading achievement they found that 39.3 percent of a group of 150 ninth-grade pupils were below the seventh-grade norm, 18.7 percent were in the seventh-grade range, and 23.3 percent were in the eighth-grade range. In order to provide appropriate remedial instruction the English classes were divided into five sections on the basis of reading achievement, four of which were in need of definite help in reading. The training procedure included the use for eighteen weeks of one lesson daily of *Standard Test Lessons in Reading* by McCall and Crabbs.

Class graphs of the grade scores made on these tests were posted weekly, and each pupil endeavored to see how much he could improve his own record. Attractive reading material was displayed in the classroom and an opportunity was given to begin reading it in class. The *Learn To Study Readers* (Books IV and V) were used for varying lengths of time in the four sections, ranging from six weeks in the highest section to twenty-three weeks in the lowest section. An effort was made to show how important reading ability is to a pupil in high school, and the interest manifested by the pupils throughout the work indicated that this attempt to motivate it was successful.

When the reading tests were repeated at the end of the training periods the median grade achievement score was 9.2—a gain of 2.1 grades. Although no control group was reported, it is obvious that the training provided was very effective.

Highly specialized training, if intelligently planned, is usually effective in securing improvement along a given line. For example, Carroll (111, 1926) gave specific training in reading directions to two seventh-grade classes for ten minutes daily for thirty days. The results showed that “drill in reading directions produces marked improvement” in this and similar types of exact reading but does not affect other mental functions not involved in careful and precise reading. One of the implications of these findings is that too much reliance should not be placed on narrow or highly specialized training in overcoming general reading deficiency. This view is supported by the results of a study by Tressler (129, 1928) which showed that only moderate improvement in reading achievement was secured through systematic vocabulary work and training in reading difficult sentences during ten-minute drill periods. It is obvious that specialized training secures improvement along specific lines. A carefully planned training program is necessary in order to improve achievement in all essential phases of reading.

The influence of the teacher is very significant in improving reading achievement among high-school pupils. This statement is supported by the results of a study by Miles (124, 1926) who provided a variety of exercises to improve comprehension during a period of twelve weeks. After analyzing the results of his study he concluded: “If the teacher makes sure that the remedial drill is actually producing a cure, if he shows the pupil what causes his deficiency and how it can be removed, if he maintains interest and continuously calls forth effort on the part of pupils, then dull, slow readers can be taught to read more accurately and even brilliant pupils can be urged to a higher degree of comprehension.”

As a rule a combination of group and individual instruction is desirable. Leonhardy and others (122, 1927) provided (a) the socialized recitation to bring out the “spirit of competition” and the “zeal to excel” and to “increase interest through the contributions of various pupils to the general discussion,” and (b) individual instruction “to give the pupil time to work out individual problems and review what has been discussed in the socialized period” and “to enable the teacher to give personal help to various individuals.” Three types of training were emphasized: practice with words, emphasizing meanings as well as pronunciations; practice in reading for comprehension, emphasizing memory, inference, comparison, analysis, classification, reasoning, evaluations, judgment, predictions; and reading for appreciation. After training had been provided for ten weeks to a

group of sixty junior high-school pupils, the median gain was 2.5 grades. The investigators emphasized in their conclusions the fact that instruction should be at the level of the child's present achievements and needs in reading.

The remedial training given in secondary schools should be based on a detailed analysis of the reading deficiencies of the pupils and adapted to individual needs. This conclusion is supported by all remedial studies reported, such as those by Gray (118, 1924), and Monroe and Mohlman (125, 1924), and McCallister (123, 1931). McCallister stated that the "results of the tests show that twenty-three of the twenty-seven pupils made greater improvement in reading during periods of training varying from eight to twenty-four weeks in length than would be expected in a year's school work without special training."

Methods of Improving Reading in Content Subjects

One of the very promising developments during recent years is the effort of teachers of content subjects to improve the reading activities of their pupils. For example, Kimmel (121, 1925) gave tests to a high-school freshman class in "community life English" during the first week of the semester, which revealed a relatively high rate of reading but a low index of assimilation. Accordingly steps were taken to improve their habits in assimilating the content of what was read. At frequent intervals the pupils were asked to prepare reproductions of certain passages. "Later the papers were exchanged and the pupils checked one another's papers as the instructor read the ideas which should have been reproduced. These written exercises tended to center the pupils' attention more directly on their reading efficiency. The fact that they were permitted to check one another's papers appealed to members of the class and thus helped to create an interest in overcoming individual weaknesses." The results of both informal tests and the *Thorndike-McCall Reading Test* showed consistent improvement throughout the course in the ability of pupils to grasp the meaning of what they read.

The results of this and other studies justified Eurich (114, 1929) in the conclusion that every secondary-school teacher may well provide training to develop desirable reading habits as well as disseminate knowledge in her special subject. "Perhaps such training may be even more important than the subjectmatter taught." Some of the types of exercises suggested by Eurich to help develop more proficient reading habits follow: underlining the topic sentence in a paragraph; writing a summary sentence for a paragraph (or longer unit); underlining difficult words while reading and then writing the definitions of these words as determined from the context; checking the truth or falsity

of statements according to the interpretation of a paragraph; outlining passages; checking possible interpretations of paragraphs. The guidance by content teachers in such activities usually results in more detailed attention to meanings and clearer interpretations.

Relative Value of Different Reading-Study Procedures in History and Science

Wide interest has been expressed in the merits of various reading-study procedures in history and in science. Beauchamp (110, 1923) conducted a series of experiments with two ninth-grade classes in general science to determine the relative merits of undirected study and each of three directed study procedures. His conclusions follow:

Specific training in finding the central thought of a paragraph, determining the questions one must be able to answer in order to obtain an adequate understanding of a topic, and reading an entire block of material through for its general plan, produces a more thorough comprehension of the subjectmatter than undirected study on the same material. Training the pupil to make various types of analyses of the subjectmatter increases the ability of the pupil to interpret and reproduce what he reads. The gain in rapidity of silent reading is greater if the pupil is not required to make an analysis of what he reads.

The relative merits of extensive and intensive reading have been studied by several investigators. Moon (126, 1927) in a study including two high-school history classes found that "the class which read extensively and collected information as an incidental part of the process was able to remember more facts and to do better on tests than the class which spent most of its time in the intensive study of the facts which it was expected to remember." Good (116, 1925) also carried on similar experiments in the social science field. The results were measured by (a) range and accuracy of information, (b) ability in problem-solving or ability to apply knowledge to given situations, (c) ability to see relationships or to outline, (d) ability to reproduce ideas or thought units, and (e) ability to retain material read. The results of the information tests showed that the extensive readers secured higher scores than did the intensive readers. With regard to problem-solving, the extensive readers were somewhat superior in evaluating and in solving certain problem situations; in the case of outlining, extensive reading seemed to be advantageous. In the reproduction of ideas, the intensive reading of a relatively small amount of material enabled a reader to reproduce practically as much as he was able to reproduce after a superficial reading of a larger amount. With regard to retention, extensive reading was more effective as measured by the information and problem retests and less effective as measured by the reproduction retests. Curtis (113, 1924), in a series of studies to determine the value of extensive reading in general science, found that it serves to increase individual achievement

in the field. It "stimulates the desire of some pupils to proceed further with the study of science in the school," and it "contributes to the scientific attitudes of the individual but not to the extent secured by a small amount of class time devoted specifically to the teaching of scientific attitudes." Curtis' study is open to the criticism that much of the data presented were secured through questionnaires. Although the results of these studies are not in complete agreement, they indicate that both extensive and intensive reading have specific values. It follows that teachers should discriminate between the two in helping pupils to achieve specific results.

The relative value of a single versus two readings of a given body of material has been studied by Good (117, 1926). He found that two readings at normal rate prove more effective as measured by an information test than one reading. Since two readings require virtually twice as much time as one reading, he questioned whether the additional amount of time required is compensated by the greater range and accuracy of the information secured. In his judgment a "single reading of a larger body of material should prove more effective than the rereading of a smaller body of material" in securing information. This view is indirectly supported by the findings of Gatto (115, 1927), who measured the effect of enriching the study of history through the use of appropriate parallel selections. He found that the reading of a short selection pertinent to the lesson in the text is a great aid in the comprehension and retention of history, if properly motivated. The repetition involved in such supplementary reading "brings an advantage in understanding and retention out of all proportion to the time and effort it demands."

Methods of Increasing Comprehension and Appreciation in Literature

Several studies have been reported which show how well high-school pupils understand what they read in the field of literature. For example, Irion (119, 1925) found that "the reading comprehension of ninth-grade students varies considerably with different literary selections." He also found that there was a close correlation between literary comprehension and reading comprehension as measured by the *Thorndike-McCall Reading Tests*. Furthermore, great disparity exists between the teacher's literary comprehension and that of his pupils. Two steps recommended in improving the literary comprehension of pupils were to increase their background of experience and to improve their reading comprehension.

The value of extensive reading of literature among high-school pupils has been demonstrated in at least three studies. Coryell (112, 1927) compared the merits of extensive and intensive reading. She found

that the extensive reading group made as good scores on all tests of comprehension and appreciation as did the intensive reading group. In addition, the extensive reading group read six times as much literature as the intensive reading group. The greatest improvement in reading ability occurred in the "low extensive reading group." Bernard, Anderson, and Raybourn (109, 1928) secured reports from senior high-school pupils which indicated that a wide reading course in modern literature cultivated literary taste and aided in preparing pupils for the worthy use of leisure time. Williams (130, 1929) secured results which corroborate the general conclusion, "that extensive reading methods are more effective in achieving the aims of instruction in literature than are intensive study methods."

The value of directed study, particularly in the case of difficult selections, has been demonstrated by Ruhlen (128, 1926) who attempted to determine the extent to which an eleventh-grade class understood and appreciated *L'Allegro*. In initial tests to measure sense of rhythm and power of imagery it was found that the class had a good ear for rhythm but was prepared to appreciate only 23 percent of the imagery. After four days spent in the study of the poem, the original tests were repeated with notable improvement. The class "now understood about 50 percent of the images of the poem." Subsequent experiments with *Il Penseroso* supplied clear evidence of the value of guidance in securing appreciation.

The results of the studies to which reference has been made show clearly that extensive reading and intensive study of literature have distinct values and should be used discriminatingly. The evidence available justifies the wide use of extensive reading in promoting appreciation.

Methods of Stimulating Reading Interests

Many studies have been reported on the nature of the reading interests of high-school pupils. Very few investigations have been carried on to determine the most effective methods of stimulating interests and elevating reading tastes. Rasche (127, 1929) secured reports from teachers and librarians concerning the methods which they used in this connection. As a result, 110 master methods were identified. Examples follow: providing a browsing corner, using advertising methods, allowing pupils freedom of choice, encouraging the organization of reading clubs, assigning studies in current events, requiring reading that is correlated with content subjects, preparing displays of books and magazines, inviting parental cooperation, and scheduling storytelling periods. Rasche's study led to the conclusion that teachers and librarians are devoting most of their efforts to getting children to read and little effort to improving reading tastes.

CHAPTER IV

Language, Grammar, and Composition

THE INVESTIGATIONS reviewed in this chapter are limited to those made or published in 1929 and 1930.

Investigations Concerning the Curriculum

Language activities in daily life—Barnes (134, 1930) endeavored to determine suitable objectives of instruction by analyzing social needs. He studied certain aspects of the out-of-school language activities of children of junior high-school grades. Records from 4,979 children revealed 25,864 language situations, 31,511 topics used in expression, and 38,809 types of language activity. For instructional purposes Barnes has later classified the language activities into eight large divisions: conversation, story-telling, friendly letter, discussion, explanation, business letter, argument, speech making. To these he has appended a number of minor types called social, personal record, business, parliamentary and literary types. The most significant conclusions reached by Barnes are:

The out-of-school language activities indicate that American boys and girls of seventh, eighth, and ninth grades are sufficiently similar and homogeneous to be regarded as a somewhat close-knit and closely integrated group. . . .

An example of redefining the curriculum in terms of social activities is found in Johnson's (146, 1929) analysis of the desirable qualities of the participants in round-table discussions. He secured traits from interviews, from questionnaires, from selected readings, and from lists of individual difficulties. The traits were ranked as to importance by seventy-nine competent judges in the following order: (a) skill in directing the discussion, (b) good understanding of subject under discussion, (c) fairness, (d) ability to secure participation, (e) firmness, (f) knowledge of parliamentary rules, (g) tact, (h) modesty, (i) ability to speak concisely and clearly, (j) ability to think quickly and accurately, (k) self control, (l) courtesy, (m) broadmindedness, (n) practical knowledge of psychology, (o) sense of humor, (p) originality, (q) correct use of English, (r) democratic spirit, (s) pleasing voice qualities, and (t) enthusiastic interest.

Language concepts needed by college freshmen—Pressey and Pressey (153, 1930), by analyzing textbooks in foreign language and in English composition, attempted to determine the language concepts needed by college freshmen. Two lists of concepts were compiled from the study: (a) forty-five concepts that should be known by students

who have studied no foreign language; (b) forty-one concepts that should be known by students who have studied a foreign language for two years in high school.

Specifics sought through social utility of items of usage—Through an analysis of stenographic reports of 107,000 words of conversation of high-school pupils, Matravers (152, 1929) selected the items of grammar which have the greatest "social utility," and the items which furnish the most frequent opportunity for error. He found that accuracy in eighteen forms of usage would eliminate 63.8 percent of the actual errors. The indexes of social utility ranged from 30.7 percent for *ain't* and the corresponding forms of the verb *to be* to 0 percent for the past tense form of the verb *lie*. One form of the double negative ranked second, and *those or them books* ranked third.

Harap (142, 1930) presented a common-error list in grammar, punctuation, and sentence structure compiled from the findings of thirty-three investigations in correct usage. The list contains 106 specific items that "should be treated as separate units for purposes of instruction." These items were distributed under eight categories: forty-four verb uses; twelve pronoun uses; eight adjective and adverb uses; four preposition and conjunction uses; ten noun uses; six items of sentence structure; fifteen uses of punctuation marks; and five uses for capital letters.

Tendencies toward functional grammar—Rivlin (154, 1930) found that 60.3 percent of the grammar in English textbooks published in 1930 is functional grammar, while only 25 percent of the grammar in textbooks of 1900 was functional. One hundred and sixteen elementary teachers, sixty-two high-school teachers, forty-nine graduate students in English, and four "experts" expressed their judgments as to the importance of language items. Table XVI, "The Functions of the Items of Grammar," on pages 62-80 of Rivlin's report, if accurate, is very illuminating. For example, the objective case of the noun has under it ten "constructions"—direct object, object of preposition, in apposition, indirect object, adjunct, adverbial objective, predicate accusative, retained object, subject of the infinitive, and secondary object. The table indicates that *not one* of the ten items functions in the correct use of nouns in the English language. Non-functional is the judgment concerning a very large share of the items included in Table XVI.

Measuring textbooks by educational principles—Marye (151, 1928-30) set up a list of objectives that textbooks ought to accomplish. She considered (a) an analysis of six modern textbooks, (b) judgments of one hundred teachers of English, (c) tendencies in recent courses of study, (d) authoritative statements of leading educators. From these sources Marye developed a form for measuring

English textbooks. The major characteristics of a good textbook according to her rating form have to do with (a) mechanical makeup, (b) organization of subjectmatter, (c) general methods, (d) content of expression, (e) development of expression, (f) motivation of expression, (g) content of mechanics: grammar, (h) content of mechanics: punctuation, capitalization, spelling, word study, (i) methods used to develop mechanics, and (j) miscellaneous materials.

Coale (139, 1928) secured the judgments of high-school teachers of English concerning the "collegiate preparation best suited to the needs of the teacher of English." Chief emphasis in professional courses, according to English teachers' judgments, should be given "to knowledge of a wide range of literature, of literary types, of Shakespeare, of recent literature, of literary criticism, and of rhetoric; to ability in public speaking, in descriptive and narrative writing, and in expository and persuasive writing; to knowledge of the principles of education and of educational psychology; to knowledge of objectives in English teaching and of current problems and progress in the subject; to knowledge of history, of social science, and of general psychology; and to discriminative literary taste."

Investigations in Correct Usage

Bushnell (136, 1930) made five comparisons between the oral expression and the written expression of one hundred tenth-grade pupils' rating on *Van Wageningen Composition Scale*; errors in grammar, sentence structure, and good usage; language usages in themes of different quality levels; vocabulary; and the relationship between sex, fluency, and English grades in oral and written composition. Written expression is consistently superior in thought content and sentence structure and is less subject to all errors.

Errors in written English of college freshmen—An analysis of two hundred letters of application written by entering students in teacher-training institutions of Ohio, made by Ashbaugh (133, 1928), revealed the most frequent errors: (a) misuse of comma—275 errors by 136 applicants; (b) capitalization errors—182 errors by 104 applicants; (c) errors in spelling—108 errors by 59 applicants; (d) errors in paragraphing—by 62 applicants. Chapman (137, 1929) examined university entrance examination essays and classified two thousand errors in fifteen categories: (a) vocabulary, (b) spelling, (c) clarity, (d) preposition and conjunction, (e) carelessness, (f) punctuation, (g) grammar—pronouns, (h) grammar—verbs, (i) sentence structure, (j) slang, (k) apostrophe, (l) use of capital, (m) confusion of adjectives and adverbs, (n) quotation marks, and (o) miscellaneous.

Fifty-two types of errors made by 638 entering college freshmen were classified by Eason (140, 1929) under five major headings: (a) punctuation, 37 percent; (b) sentence structure, 23 percent; (c) spelling, 23 percent; (d) capitalization, 12 percent; and (e) grammar, 5 percent. Clark (138, 1928) studied the frequency and persistency of errors in sentence structure of university freshmen. Three items—sentence fragment, stringy sentences, and comma splice—caused over one-third of the total number. Comparison of errors made at the beginning of the year with those made at the end of the year showed a high percentage of decrease for certain types of errors: wrong use of modifiers, fragments, lack of proper subordination, redundancy and repetition, inconsistencies in structure. Improvement of individual students was not consistent.

Sullivan (157, 1929) analyzed the errors of 16,660 high-school pupils on a minimum essentials test made up of one hundred points: twenty-five in spelling, forty in punctuation and sentence structure, and thirty-five in grammar. She found that "without exception in any class of school, punctuation and sentence structure are the least well mastered." The capitalization of the proper adjective was the cause of greatest trouble. Other items of punctuation and sentence structure which caused great difficulty were possessive forms, apostrophe for contractions, use of the capital to begin a quoted sentence, and the run-on or comma splice. The grammatical errors made most frequently were the agreement of the adjective with its noun (*this kind*); the agreement of the verb with its subject; and pronoun case forms, especially as a part of the compound object of a preposition.

Validity of formal language tests—Henmon (144, 1930) found that the most reliable single index for prediction of achievement in college freshman English was the reading and grading of test themes. The coefficient of correlation with first semester marks was found to be $+.66$. The *Wisconsin Language Test*, a close second, showed a correlation coefficient of $.60$ with marks. The combination of theme rating with the language test scores gave a multiple correlation coefficient of $.72$ with marks. In the light of the evidence Henmon considered the language test of satisfactory predictive value, but suggested the addition of another set of twenty-five items shown experimentally to improve the validity of the test as a whole.

Hartson (143, 1930) reported a five-year study of the value of objective English tests for sectioning college freshmen for English composition courses. Comparison of results of sectioning students by theme reading and of sectioning on the basis of scores secured through administering a battery of English tests showed that the test scores were more valid measures and that the data from tests were more quickly obtained.

Investigations in the Field of Written Composition

Evaluation of composition scales—Speer (156, 1929) attempted to discover which of the existing composition scales is most objective and which has the best administrative feasibility. Twenty-five teachers of English, untrained in the use of composition scales, graded one hundred sixth-grade compositions by the use of seven scales. The seven scales, ranked in the order of their objectivity both before and after the training of the judges are shown in Table 2. However, Speer overlooked the vital fact that the seven scales compared are radically dissimilar in purpose.

Vocabulary content—By means of an analysis of 161,640 running words in compositions written by pupils in the seventh through the twelfth grades, Ashbaugh (132, 1929) found that in the seventh and eighth grades nine words and their repetitions make up 25 percent of the total running words, while in the other four grades ten words and their repetitions make up 25 percent of the total. The number of different descriptive adjectives varied from 168 in seventh-grade letters to 328 in twelfth-grade letters. Few comparative or superlative forms appeared. Eighty-three adjectives were used 3,229 times in six hundred letters.

Relation between composition ability and general intelligence—In order to construct a differentiated course of study for slow, average, and fast-learning groups, Huxtable (145, 1929) made a survey of the composition abilities of junior high-school pupils. Descriptive criteria were set up to classify levels of thought expression on each of four known I. Q. levels. These criteria were defined as (a) inarticulate thoughts, (b) unrelated thoughts (on sense perception level), (c) related thoughts, (d) reflective thoughts, and (e) creative thoughts. Huxtable found that high correlation exists between a

TABLE 2. EVALUATION OF COMPOSITION SCALES BY TEACHERS (SPEER)

| Scale | Before training | After training |
|-----------------------|-----------------|----------------|
| 1 | 2 | 3 |
| Hudelson English..... | 1 | 1 |
| Hudelson Typical..... | 7 | 6 |
| Leonard..... | 3 | 2 |
| Lewis..... | 5 | 4 |
| Nassau..... | 2 | 3 |
| Van Wagenen..... | 6 | 5 |
| Willing..... | 4 | 7 |

pupil's I. Q. levels and the complexity of the thought he expresses and that the tendency to unify thoughts becomes increasingly consistent with the higher I. Q. levels. Frequently, however, pupils with high I. Q.'s fall to levels of average or low accomplishment judged by the complexity of the thoughts expressed. Such results indicate a need for improved teaching with respect to thought content.

Investigations in Methods of Teaching

Advantages of differentiated instruction—In a three-year experiment Billett (135, 1928) compared work of ninth-grade English classes grouped homogeneously with the work of classes grouped heterogeneously. He found that the safest criteria for grouping are intelligent quotients, probable learning rate, or the index of brightness. Results of objective tests and ratings with composition scales showed that slow pupils profit greatly by homogeneous grouping, average pupils gain but slightly by such grouping, and bright pupils make greater progress in heterogeneous groups.

Cooperation between the English department and other departments—Garbe (141, 1930) utilized the content subjects as the point of departure for the oral and written expression in the English classroom. The class time for 238 periods was divided among nine activities as follows: (a) oral composition, (b) written composition, (c) formal grammar, (d) class instruction in usage, (e) preparation for composition, (f) teacher motivation, (g) pupil motivation (authors' club), (h) formal instruction in spelling and handwriting, and (i) testing. Garbe found that the number of stories written by the pupils were surprisingly high. During the last fifteen weeks of the experiment eighteen pupils wrote 125 stories, many of which were original projects and imaginative writings. Analyses of errors on written compositions showed that the range in percentage of error was reduced from a range of .5 percent to 33 percent at the first of the year, to a range of 0 percent to 9.6 percent at the end of the year.

Symonds and Chase (158, 1929) subjected groups of children to practice in English usage without motivation, and to two types of motivation, one called "test motivation" and the other "intrinsic motivation." The results showed that the amount of repetition is the important single factor in learning by repetition or by the types of motivation used in this experiment. Ten repetitions with no special motivation proved to be more effective in learning than any combination of three repetitions with more forceful motivation. Test motivation caused some learning over and above that which could be secured by practice, but intrinsic motivation caused no learning in addition to practice.

Thomas (159, 1931) sought to determine the extent to which formal drill of the dictation and multiple-response types on the more

important technical errors in English reduced such errors in similar formal situations and in written composition. In each of several high schools experimental and control groups of ninth-grade pupils were matched on the basis of theme-error scores and were also shown to be approximately equivalent in formal test scores. The experiment lasted for a period of twelve weeks during which time important non-experimental factors were rather carefully controlled. Gains in achievement were measured by means of a series of five English tests and by a theme. Significant differences in achievement were reported in favor of formal drill of the dictation and multiple-response types, both in the reduction of errors in formal tests and in written composition.

Klopp (147, 1931) conducted an experiment with thirteen classes in tenth-grade first-semester English in which the intensive formal grammar drill method was shown to be less effective in engendering the ability to apply what is learned than an informal method described as follows:

These teaching units are developed on the principle of mastery of the most common grammar errors by means of self administering drills and tests. Each unit aims to stress only a few of the fundamental elements which appear as errors in the early grades and persist through the junior college. The child is introduced to the first unit by the instructor, after which the child assumes the responsibility and works on his own power and at his own rate, which results in an ability to identify his own weakness and correct his own errors. The scheme is self motivating in that the child can test his own degree and rate of progress, which in itself has proved to be the most stimulating element in the unit plan.

Ash (131, 1931) reported a carefully conducted experiment on the effectiveness of the stylistic approach in teaching written composition in the junior high school. The experimental group of 85 pupils in one high school was approximately equivalent in "age, mental capacity, ability to write, nationality, amount of school attendance, and length of time during which they had attended their respective schools" to the two control groups of 83 and 106 pupils each, which were located in two other junior high schools. The report indicated that suitable precautions were observed in attempting to control important non-experimental factors such as training and experience of teachers and numbers of compositions written by the experimental and control groups. The experiment is to be particularly commended for the careful analysis and rating of compositions written by the experimental and control pupils for the purpose of securing the scores through which the achievements of the groups were determined and compared. The conclusions favored the stylistic approach in the teaching of written composition:

Many of the form factors of written composition can be secured by emphasizing content through its application in written thought. It pays to spend more time on the

stylistic phases of composition and less on the grammatical. . . . The experimental group, which was taught the stylistic and content phases with but little emphasis on form, made even more progress on form than did the control groups, which had but little of the content phases.

Leonard (148, 1930) attempted to determine "whether the use of practice exercises in the nature of proof reading, error correction, and dictation improves the pupils' abilities to write compositions free from punctuation and capitalization errors." The results of the study indicated that practice exercises are economical and effective teaching devices and that there is transfer from these types of exercises to writing compositions.

Maloney and Ruch (150, 1929) carried out a "three-track" experiment in the teaching of grammar in the high school to determine the value of tests in teaching. For ten weeks three groups from each of the ninth, tenth, and eleventh grades were taught by three different methods: Method I, textbook only; Method II, objective tests only; Method III, textbook and objective tests combined. The test method proved superior to the other two methods in all grades, and the combination method was second in every case.

Establishing patterns of workmanship in composition—With the assistance of thirty teachers and thirty classes of children of junior high schools, Lyman (149, 1932) conducted an experimental course of seven units of composition. The major purposes were (a) to determine the extent to which a limited number of experiences can enable pupils to establish patterns of planning composition, and (b) to discover the extent to which repeated practice in appraising their own compositions will enable children to find and correct language errors in their own first drafts. Elaborate data indicated that pupils can learn to use appropriate work patterns and that much of the labor now expended by teachers in detecting errors may profitably be carried out by the pupils themselves under supervision.

Effect of class size on achievement in English composition—Smith (155, 1930) reported a two-year experiment with a ninth-grade class in English to ascertain the effect of class size on pupil achievement. Forty-one of the 143 pupils in the study were taught in groups of 20 or 21, and 102, in groups of 48 or 51. Achievement during the two-year period, as measured by objective tests, revealed the following facts concerning the effect of class size upon the efficiency of teaching in respect to grammar, language, and composition:

1. The efficiency of instruction was independent of the size of the class in grammar, punctuation, capitalization . . . and composition exclusive of letter writing.
2. The small classes were definitely better in letter writing. . . .
3. Large classes were decidedly advantageous for progress in spelling, vocabulary . . . and general spirit and enthusiasm for the work.

CHAPTER V

Social Studies

ALDERMAN (160, 1922) reported an experiment in which he sought to determine the relative effectiveness of the lecture method versus the "question and answer" method of teaching history. Two hundred and seventy-one ninth-, tenth-, and eleventh-grade pupils were taught lessons on the governments of England and Switzerland by the compared methods, a rotation technic being used. While the results did not significantly favor either method, they indicated that the brighter pupils achieved slightly more with the lecture method and the duller pupils achieved slightly more with the question and answer method. Crawford and Slagle (162, 1930) reported that the "laboratory" method is slightly more effective than the lecture method in United States history, economics, and civics.¹ The conclusions of both of these experiments are not highly dependable. A significant criticism which applies to both concerns the failure to measure outcomes other than memorized information.

Gorman and Morgan (168, 1930) studied the effect of definite written exercises on achievement in American history and reported that brighter pupils achieved relatively more without definite assignments to be written and handed in, while duller pupils achieved relatively more when definite written assignments were made. Christ (161, 1926) evaluated a method of assigning pupils in history-learning exercises which were requests to record important information on 3-by-5 cards. All but 5 out of 111 pupils reported that they liked the method, particularly because of the usefulness of the cards in review.

Key (171, 1930) sought to determine the relative effectiveness of the "type-study" and "textbook" methods. In the type-study method one incident or individual in history is taken as a type and studied intensively. Related incidents or individuals are then studied more briefly and compared with the first. The differences in mean gains in achievement for three pairs of groups were favorable to the type-study method, but none of these differences were statistically significant. Freeble (164, 1930) compared the effectiveness of a method in which a study guide was employed with the effectiveness of the contract method. Two equivalent groups of tenth-grade pupils in modern European history were used in this rather carefully conducted experiment.

¹ For comprehensive information with respect to present practices in social studies laboratories, See: Baldwin, J. W. *The Social Studies Laboratory: A Study of Equipment and Teaching Aids for the Social Studies*, Teachers College, Columbia University, Contributions to Education, No. 371. New York: Bureau of Publications, Teachers College, Columbia University, 1929. 98 p.

The differences in achievement as measured by several objective tests were favorable to the study-guide method but not significantly so. Pierce (177, 1919) reported a relatively crude experimental investigation of the effectiveness of individualized instruction. While the conclusions were favorable to individualized instruction, the many limitations of the data necessitate that these conclusions be characterized as undependable.

Three experimental evaluations of the contract method, in addition to that of Freeble, were reported in the social studies. Willard (183, 1929) sought to determine the relative effectiveness of the "Ambridge Plan of Instruction," a modification of the Dalton plan, and of the ordinary method of recitation. Two groups of thirty-six pupils each in American history were taught by the compared methods for a period of fourteen weeks. While the differences in achievement significantly favored the Ambridge Plan, it is possible that these differences might with more justification be ascribed to greater zeal for a more fashionable method. Shepard (179, 1929) compared the effectiveness of the "traditional oral assignment-recitation method and the written 'contract' method in sixth-grade history in a school system where departmental teaching is not possible." Two equivalent pupil groups of unreported size were taught for eight weeks, the compared methods being rotated at the end of each two weeks. The differences in achievement were not significantly in favor of either method. Esson and Cole (163, 1929) compared "a modification of the procedure advocated by Morrison and Miller," which they characterized as a "contract" plan, with the ordinary method of instruction. The experiment was rather carefully conducted. Two groups of 137 pupils in history in ten high schools were shown to be equivalent with respect to intelligence and initial achievement in history. While experienced and well-trained teachers participated in the experiment, the contract method was new to them. It is stated, however, that the activities of the teachers were directed by mimeographed sheets prepared by the experimenter. The differences in achievement as measured by objective tests were only slightly favorable to the contract method, while the differences measured by informal tests designed to measure mastery of facts and creative ability were much more favorable to the novel method. While the experimenters indicate that library facilities and teachers' previous experience with instructional procedures were not favorable to the contract plan, it is significant that the teachers were enthusiastic about the plan. It may be concluded, therefore, on the basis of the data secured in these experiments that while the contract plan is an effective method of instruction in the social studies, it has not been dependably shown to be more effective than the traditional methods of instruction.

Washburne (181, 1929) reported an extensive investigation involving 1,456 seventh- and eighth-grade pupils, in which the problem was that of determining the effect on achievement of questions included in social-science material. A three thousand-word historical account "rich in factual and generalization material" was prepared in four forms: (a) with no questions; (b) with all of the questions at the beginning of the story; (c) with questions interspersed at the beginning of appropriate paragraphs; (d) with all of the questions at the end of the text. The pupils in each group were given twenty-five minutes to study one form and were then tested by a fifty-five-item objective test. The conclusions were decidedly favorable to the use of questions, particularly when grouped at the beginning of the material. "Preview questions calling for generalizations result in an improvement in generalizing which spreads to facts not covered by such questions." Helseth (169, 1926) also reported an investigation of questioning in history teaching, but in her investigation the problem was that of determining "what improvement in thinking about questions from United States history will be made by a class of seventh- and eighth-grade pupils encouraged to ask questions with regard to United States history and to answer these questions according to their own plans." Directing pupils' attention to their methods of study was reported an effective means of stimulating them to ask questions and to seek answers for these questions themselves.

Gatto (166, 1930) investigated "the effect of reading a historical article in its entirety, reading it sectionally, and reading it by a combination of both methods." A historical article of 1,400 words in length was presented with directions to three equivalent groups of twenty-five seventh-grade pupils. Retention of information was measured immediately, one week later, and two weeks later by means of a sixty-item objective test. The differences so far as retention were concerned slightly favored the first method. Good (167, 1926) compared the effectiveness of a single reading with two readings of social science material. The conclusions of this experiment stated that "two readings of a given body of material are more effective than a single reading of the same assignment." This rather obvious conclusion may be accepted as dependable, even though it is supported by somewhat limited experimental data. Since two readings require approximately twice as much time as a single reading, Good questions the advisability of recommending rereading when appropriate supplementary assignments may be made.

Moon (176, 1927) and Weaver (182, 1931) studied the relative effects of extensive and intensive reading in history. The conclusions of Weaver did not favor either method, but Moon stated that "the class which read extensively and collected information as an inci-

dental part of the process was able to remember more facts and to do better on tests than the class which spent most of its time in the intensive study of the facts which it was expected to remember."

Knowlton and Tilton (172, 1929), McClusky (175, 1924), and Freeman, Reeder, and Thomas (165, 1924) reported experimental evaluations of the use of motion pictures in teaching history and other social studies. The conclusions of the comprehensive investigation of Knowlton and Tilton (172, 1929) with junior high-school American history were quite favorable to the use of films, but the conclusions of the equally comprehensive experiment of McClusky (175, 1924) and of the less extensive experiment of Freeman, Reeder, and Thomas (165, 1924) were rather unfavorable to this means of visual education. It should be noted that the children participating in the experiments of McClusky (175, 1924) and of Freeman, Reeder, and Thomas (165, 1924) were not above the eighth-grade level. Ross (178, 1928) and Lewerenz (173, 1929) reported minor investigations of the effectiveness of still pictures in teaching social studies subjectmatter. The conclusions of both were favorable to the use of pictures, but those of Ross were stated with reservations. Washburne (180, 1927) reported an interesting and comprehensive investigation of various means of presenting quantitative material in social studies subjectmatter. Examples of his conclusions are: "For complex or slightly complex static comparisons, use a bar graph. For extremely simple static comparisons, use a pictograph. For dynamic comparisons, use a line graph."

The conclusions of a number of miscellaneous studies may be given. Winch (184, 1930) reported that dates rather than centuries should be emphasized in teaching chronology in history. Lewis (174, 1927) reported that encouraging pupils to collect newspaper clippings relative to the course is an effective means of stimulating learning activity in citizenship classes. Hill (170, 1922) showed that English may be taught effectively in connection with civics.

CHAPTER VI

Modern Foreign Languages

SINCE its inception in 1916 one of the annual functions of the *Modern Language Journal* has been to compile an annotated bibliography of articles on methodology which had appeared during the year. In retiring from a ten-year connection with that service, Professor John Van Horne of the Department of Romance Languages, University of Illinois, recently summed up his experiences and tried to discern the trends of the literature during that time (215, 1930). After noting that 654 items of the 1,178 listed during his regime had appeared in the four years from 1925 to 1928, due to increased activity with tests and measurements, the investigations stimulated by the Modern Foreign Language Study, and the increase from 14 to 25 contributing journals (of which the language journals increased from 5 to 10), he summarized the principal directions taken by the literature of methodology of the period:

1. Objective tests and measurements for vocabulary, grammar, and comprehension have been studied, established, and improved. Experimentation proceeds.
2. Extensive word and idiom lists have been compiled.
3. Educational experts and language teachers have attacked problems together.
4. Prognosis, intelligence testing, overlapping, sectioning, and individual differences have been taken in hand.
5. Statistics have been accumulated on a vast scale.
6. What to do with the two-year course has become a leading issue.
7. The reading objective has been greatly stressed.
8. Organized, cooperative research has flourished.
9. Specific language journals have multiplied. Despite a certain aggressiveness, they seem to have considerable sense of cohesion.
10. From time to time bibliographies have striven to keep abreast of the mighty flood of articles and textbooks that are poured forth unceasingly.
11. Phonetics, syntax, and contemporary literature have claimed numerous articles.
12. Many admirable, independent articles have appeared, miscellaneous in character, often based on classroom practice or experience.

The following summary is restricted to reports of research that deal specifically with instructional procedures. The reader who is interested in a more comprehensive bibliography should consult the annual list by Young, Van Horne, and others in the *Modern Language Journal* or one of the following:

1. Buchanan, M. A. and MacPhee, E. D. *An Annotated Bibliography of Modern Language Methodology*. Publications of the American and Canadian Committees on Modern Languages, Vol. 8. Toronto: University of Toronto Press, 1928. 428 p.
2. Cole, Robert D. *Modern Foreign Languages and Their Teaching*. New York: D. Appleton and Co., 1931. 598 p.

3. Fife, R. H., compiler. *A Summary of Reports on the Modern Foreign Languages*. Publications of the American and Canadian Committees on Modern Languages. New York: Macmillan Co., 1931. 261 p.
4. Handschin, Charles H. *The Teaching of Modern Languages in the United States*. U. S. Dept. of the Interior, Bureau of Education, Bulletin, 1913, No. 3. Washington, D. C.: Government Printing Office, 1913. 154 p. (Out of print.)
5. Handschin, Charles H. *Methods of Teaching Modern Languages*. Yonkers-on-Hudson, N. Y.: World Book Co., 1923. p. 381-446.
6. Huse, H. R. *The Psychology of Foreign Language Study*. Chapel Hill, N. C.: University of North Carolina Press, 1931. p. 214-26.

The Study of Grammar in Learning To Read a Foreign Language

Although the question of the relative amounts of emphasis that should be given to the study of grammar, pronunciation, composition, translation, and conversation, when the general objective is ability to read a foreign language, may be considered a curriculum problem, it is generally treated under the head of methods. Phases of the problem have been studied experimentally by Bovee (189, 1923; 188, 1925), Buswell (191, 1927), Cheydeleur (193, 1931), Clarahan (194, 1913), Greenup and Segel (197, 1929), Pargment (204, 1927), Rice (206, 1930), Tharp and Murray (213, 1928), and Young and Daus (219, 1928). By means of two specially devised tests, Bovee measured the growth of grammatical knowledge and the ability to translate of pupils enrolled in the French courses of three high schools. One of these schools used a grammar translation method, the others a modification of a direct method. The results showed that in the first two years there was no striking difference in the ratio of the development of the two abilities. In the third and fourth years, however, there was a decided change. In the school taught by the grammar-translation method, the reading power remained practically stationary while the grammatical knowledge went very high. In one of the schools using the direct method there was a decrease in grammatical knowledge during the last year, but the reading ability gained very rapidly. In the other school using the direct method there was a large gain in both reading ability and grammatical knowledge during the last two years.

The second problem of Buswell's laboratory experimentation on the reading of foreign languages (191, 1927) was to determine the relative effectiveness of the indirect or ordinary grammar translation method and the "direct method." *Direct method*, as used in this study, refers to a procedure in which the student is led to deal directly with the foreign language in reading without the intervention of the vernacular symbols; that is, a non-translation method without emphasis on grammar. The major objective is the reading adaptation for purposes of comprehension; oral activities and composition are ancillary only. Data were collected by means of an eye-movement apparatus from students in two first-year and two second-year high-school French classes. Ad-

ditional data were secured by the same means from students in three high-school Latin classes. The conclusions derived by the investigator from these data are (a) the direct method as used produced habits of reading greatly superior to those produced by the indirect or translation method, and (b) where the major objective is the ability to read, the direct method is superior to the indirect translation method.

Cheydleur (193, 1931) used two groups of three classes, all of which were approximately equivalent in intelligence. The experimental group of forty-four students was taught by a modification of the Bond Reading Method. The only formal grammar taught during the first semester was with respect to the recognition, translation, and memorization of verb forms. During the second semester, however, somewhat greater attention was given to grammar in connection with reading. The control group of sixty-three students was taught by an "eclectic" method based on the *New Fraser and Squair Complete French Grammar*. The eclectic method used was characterized by instruction in translation from French to English and from English to French, by intensive and extensive reading, by instruction in pronunciation, and by a large amount of instruction and drill in grammar. The differences in achievement measured at the end of the year significantly favored the control group so far as grammatical knowledge was concerned, but the differences in vocabulary and comprehension abilities were very slight. The observation was made in the report of this experiment that 48 percent of the control and 43 percent of the experimental students continued French the succeeding year.

Clarahan (194, 1913) used three experimental classes and two control classes which were only approximately equivalent. The pupils in the experimental classes were taught by a method in which the reading of connected texts and sight reading begins early and pronunciation, conversation, composition, and grammar are treated secondarily. The pupils in the control classes were taught by a grammar method in which emphasis was placed on the formal side of the language, rules to be memorized, grammatical text analysis, and literal translation. The conclusions favored the reading method employed with the pupils of the experimental classes, but the limitations of the data are such that these conclusions should only be taken as suggestive.

Greenup and Segel (197, 1929) used two groups of twenty-three junior-college Spanish students equated on the basis of intelligence test scores and a standardized Spanish test administered at the beginning of the experiment. The control group was taught by the usual grammar translation method with a certain amount of reading and conversation. The experimental group was taught a little grammar at the very beginning, then shifted into a reading and conversational method where grammar was incidental. The differences in achievement

measured at the end of four and one-half months of instruction by means of a standardized Spanish test were significantly favorable to the experimental group with respect to vocabulary and comprehension, but were significantly favorable to the control group with respect to grammar.

Pargment (204, 1927) compared the "pure direct method" with the "grammar-translation method." Both of the groups used in this experiment consisted of two classes of students in first-year college French. At first the students employing the grammar-translation method made more rapid progress, but at the end of the first semester when the students were tested for vocabulary, oral work, and written reproduction of language, the results showed a decided superiority in favor of the pure direct method in six of the seven items tested. With the introduction of reading at the beginning of the second semester the pendulum swung the other way, and the tests at the end of the second semester showed an advantage in favor of the grammar-translation method in five out of six items. Hence the author concluded that the pure direct method cannot successfully be used in a two-year course unless we wilfully sacrifice the most important aspect of language—an intelligent reading knowledge.

Rice (206, 1930) collected data by means of several standardized tests and a questionnaire from pupils and teachers in twenty-one high schools and twenty junior high schools in California. One of the items on the questionnaire asked teachers to give information with respect to the methods used and amount of time devoted to pronunciation, oral work, translation, grammatical drill in English and in foreign language, free composition, and rapid reading. The technics of correlation analysis were applied to the test and questionnaire data. Among the conclusions it is stated that a minimum of grammar will bring larger returns in comprehension during the first two years. On the other hand, for those who continue the study of languages further than two years, an investment in grammar seems to pay increasing dividends as a longer study of the language is made. The incomplete data of this report based on "percents of time spent in class" make this report only suggestive.

Tharp and Murray (213, 1928) compared the achievement of two first-year college French classes, in which the sole objective was reading, with the achievement of regular "grammar" classes. The procedures of the two reading classes are described as follows: After the first five or six lessons in a recognition grammar, the classes began to read. Finding progress slow but certain, the grammar was not resumed. Oral readings undertaken at first were soon abandoned. At the beginning, careful translation was required of small intensive assignments.

Some sight work was done daily. Longer assignments, fifteen to twenty pages, followed, and comprehension was tested by "yes-no" and "phrase-answer" questions. Special study was made of idioms, adverbs, prepositions, and conjunctions. The classes read about 400 pages in class and 100 pages outside during the first semester, and about 550 pages in class and 180 pages outside during the second semester. Standardized tests given to these classes and also to the regular grammar classes showed the achievement of the "reading" classes to be 120 percent (in vocabulary), 140 percent (in reading), and 40 percent (in grammar) of that of the regular classes the first semester. The second semester the ratio was 125 percent (in vocabulary), 126 percent (in reading), and 16 percent (in grammar). Thus a considerable gain in vocabulary and reading and some incidental knowledge of functional grammar accrued from the practice of extensive reading with practically no preliminary grammar study.

In the experiment of Young and Daus (219, 1928) the subjects were twelve classes of first-year college students. The experimental group, consisting of six of these classes, was taught by a method in which the emphasis was placed on reading (although some instruction was given in grammar from a French-English standpoint), in vocabulary and idiom lists, in simple rules of pronunciation, and in ear-training. The control-group, composed of the six other classes, was taught by the traditional method. At the end of each semester the groups were tested with respect to comprehension, idioms, vocabulary, and pronunciation. At the end of the second semester a test in verbs was added. The results showed a gain on the part of the experimental groups in all the abilities tested. The greatest difference was in idioms, with vocabulary, pronunciation, and verbs ranking respectively. Strangely enough, considering the emphasis placed on reading, the difference in comprehension, while favorable to the experimental group, was the smallest of the differences reported. It should be noted, however, that it was approximately four times its standard error and, hence, "statistically" significant.

The findings of these experiments are in general agreement and appear to be acceptable as reasonably dependable evidence for the conclusion that when the objective is ability to read a foreign language, the most rapid progress is secured in the initial stages when only limited attention is given to the study of grammar, pronunciation, composition, translation, and conversation. It was mentioned with reference to the conclusions of Pargment and Rice that in the case of students who continue the study of a foreign language beyond the first or second year, the omission of the systematic study of grammar is a handicap.

Learning Exercises for Vocabulary

Balaban (185, 1910) concluded that the associative learning of words in context is several times more effective than the mechanical memorization of isolated words. Grinstead (198, 1915) reported an experiment in which he compared the translation of German using a dictionary for looking up the meaning of unknown words in a reading selection with the study of a formal vocabulary list. The results favored the text-dictionary method. Recently Seibert (210, 1930) studied the relative effectiveness of context exercises and formal vocabulary lists in which French words and their English equivalents appeared. The results indicated the superiority of associated pairs as learning exercises, but only sixty college students were used as subjects and the number of words was limited to twelve. Consequently the findings cannot be considered highly dependable.

In an early experiment Witasek (217, 1907) concluded that the alternation of reading and recall is more effective than continuous reading without recitation. Thorndike (214, 1914) reported an experiment with adults in which repetition was compared with recall in memorizing unknown German words and their English equivalents. Repetition (reading and re-reading) was indicated to be slightly superior. Webb (216, 1921) secured results which tended to support the opposite conclusion:

The outstanding conclusion based upon the data of this experiment is that the recall method is superior as an aid in the mastery of paired associates, determined by tests for retention. This is true whether considering group or individual results. Both groups obtain superior results by from 20 to 27 percent when employing the method of recall.

Using lists of associated pairs Stoddard (212, 1929) compared the French-English order with the English-French sequence. He concluded that when the translation of French words is the objective the French-English sequence provides the more effective learning exercise. Seibert (211, 1927) studied the relative effectiveness of "(a) learning silently, (b) learning aloud, and (c) learning aloud with an immediate recall." The results indicated the superiority of the second method.

In a minor experiment Bennett (186, 1917) found that students who studied German selections for the purpose of being able later to translate English into German attained a higher level of achievement than students who studied the selections only for the purpose of being able to translate them into good English.

Henmon (200, 1912) concluded that auditory presentation is superior to visual, visual-auditory, and visual-auditory-motor methods of present action. He reported that the visual-auditory method is more effective than the visual alone. The conclusions of an early psychological experiment of Calkins (192, 1898) disagree with the conclu-

sions of Henmon. Calkins reported that words presented visually are remembered significantly better than words pronounced and heard.

In an experiment reported by Peterson (205, 1903) it was concluded that linking the language symbol directly with the object or movement to which it refers is a most effective means of learning a native or foreign vocabulary for most individuals. Braunshausen (190, 1910) found that adolescents achieve more when the sequence is from object to foreign word rather than from foreign word to native, or native word to foreign word. Schluter (207, 1911) concluded that the foreign word-native word sequence is best if the test states the foreign word and requests the native word. The object-foreign word sequence is best if the test gives the native word or object and requests the foreign word. Schoenherr (208, 1915) reported that the direct method in which the meaning of the foreign word is derived from an object or illustration is superior to the indirect method where the meaning given the foreign word is derived from the native word. In the report of an early experiment, Kirkman (202, 1908) reported that for retention the object-foreign word sequence is better than the foreign word-native word sequence.

Recently Scholtkowska (209, 1925) reported that no one method is most effective for learning all types of vocabulary. The direct method results in better retention of concrete nouns and in better immediate recall of prepositions and verbs. It is also concluded, however, that the indirect method is more effective for nouns in adverbial combinations, for delayed recall, and for free composition.

The Value of the Free Composition Method

Cole (195, 1927) reported an experiment in which he compared the "free composition method" with the "translation method." The free composition method of teaching gave better results as measured by teacher's marks in French by college entrance examinations, and by informal tests of vocabulary, grammar, and silent reading. The free composition method of teaching also yielded a slightly superior ability to write French as measured by the particular French written. The number of students, however, was extremely small and the methods of testing were limited. Consequently the results are more in the nature of a tendency than a proved conclusion.

The Value of Repetition

Crider (196, 1929) found that repeating the translation of an assignment in first-year Spanish did not reduce the average number of errors. On the other hand, Young and Vander Beke (220, 1926) reported that the learnings of vocabulary in lists adapted to

the needs of individual students is decidedly beneficial. These apparently conflicting conclusions emphasize the general principle that repetition does not insure learning.

Miscellaneous

Wolfner (218, 1930) has reported favorable results from a system of individualized instruction which may be described as follows: The minimum assignment for the entire semester was announced. Each student was expected to use the class period to advantage and urged to progress as rapidly as possible without causing the quality of his work to fall below standard. Several members soon completed assignments in advance and had short stories to their credit. This group proved of help to the others in explaining difficult points. A chart was kept by the supervisor showing the accomplishment of each student along various lines. Frequent conferences were held for guidance.

Hunsberger and others (201, 1927) compared the Meras "Premier Livre" method with that method supplemented by ten additional minutes devoted to the *Laboratory Exercises for the Complete or Phonetic Chardenal* by Roehm and Shane. As would be expected, the additional instruction resulted in superior achievement. Kirkman (203, 1909) reported the obvious conclusion that in the teaching of foreign languages the elimination of errors necessitates several repetitions of the correction.

Hagboldt (199, 1925) reported that the use of familiar reading material, such as the Bible and Shakespeare, was effective in a first course in German. He stated in his conclusions that "reading known material in beginners courses is superior to unfamiliar texts on account of its great value in arousing interest, in building vocabulary, and in forming that precious and most indispensable element in language study-feeling."

Bovee (187, 1930) reported a four-year experiment from which he concluded that superior reading ability is secured in beginning classes by including a considerable amount of oral and written work in the instruction. The conclusion is expressed that "the element of writing not only raises the level of attainment of the class but combines with oral work so to fix the reading skill that there is a greater ratio of retention and hence a guarantee of the greater permanence of the product."

Research Needed in the Field of Foreign Language Methodology

The author of this chapter would like to propose the following problems for further educational research as representing his conception

of the basis of the study of the teaching of foreign languages in the future:

1. Experimental knowledge on the learning processes—the formation of language habits.

2. The selection of basic language units—vocabulary, idiom and grammar.

3. The organization of classes and materials to permit various speeds and produce self learners and socialized group study where needed.

4. The creation of valid, reliable tests of all learning phases and stages, mostly self administered.

5. Attention to "after-school" continuance—foreign book clubs, library facilities, talking pictures, radio, lectures, travel, international relations.

CHAPTER VII

Latin

THIS review of studies relating to Latin has been restricted in accordance with the principles set forth in the Introduction. As a result studies of considerable importance have been omitted because they merely revealed problems of method but did not contribute in any definite way to their solution. A large number of minor studies of method have been omitted because the number of subjects was too small for reliability, the problem was not clearly defined, the variables were poorly controlled, or the statistical treatment was so incomplete that the results were not dependable. The chapter includes all studies known to be available which make any significant contribution, however small, to Latin classroom method.

The Classical Investigation

A summary of research relating to the teaching of Latin should begin with a review of the Classical Investigation (221, 1924). The purpose of this investigation was to make a general survey of the present status of the teaching of the classics in America and to offer recommendations for its improvement. This ambitious program was not fully attempted and some important studies which were planned have not yet been completed. The general report includes (besides introduction and summary) statistical evidence as to enrolment, training of teachers, and the attitude of society toward Latin (Chapter II); objectives (Chapter III); content (Chapter IV); methods (Chapter V); and comparative records of classical and non-classical pupils (Chapter VI).

Although the results of the experimental studies prior to 1923 are summarized, the chapter on methods is based mainly on questionnaire data consisting of expert opinion and information relative to the nature and efficacy of the methods in current use for the attainment of specified objectives. In addition, an analysis of examination papers and studies, primarily used for the determination of objectives and content, are cited as evidence relative to methods. The treatment of method as distinct from methods is largely combined with the discussion of objectives and content.

The report favored the "functional" method, of which the main features are (a) the practice of reading Latin for the thought, in the Latin order; (b) extensive oral and silent reading of connected Latin

rather than intensive grammatical analysis of isolated sentences as a means of developing reading power; (c) the divorcement of comprehension from translation and the use of translation to develop mastery of English; (d) the study of grammar and inflection and the writing of Latin as mainly contributory to reading skill rather than as ends in themselves; (e) the study of words both as integral parts of the reading process and as contributing to an understanding of the Latin element in the English vocabulary; (f) the concurrent seeking of immediate and ultimate objectives; (g) the recognition of certain disciplinary objectives as valid, with the study of language structure and training in study habits as a means of attaining them.

It was perhaps unavoidable that the findings should rest largely upon empirical and *a priori* data, and that such studies as were highly objective should, in many cases, merely furnish an adverse criticism of traditional procedures rather than constructive evaluation of specific methods. Experimental technic in education has even today been mastered by few Latin teachers and is usually incomplete in the studies summarized in the *Classical Investigation*. Moreover, few reliable tests of Latin attainment have yet appeared, and of those which have, almost all assume the traditional method. The functional method has not yet been certainly developed to the point where an adequate and fair experimental trial of it is possible. Hence the report must be regarded as merely a hypothetical outline of method, certain features of which have received some experimental confirmation (notably, as given above, features *a*, *b*, and perhaps *c* and *d* by Buswell, and *e* by Hamblen and Haskell).

Certain portions of Chapter II and much of Chapter VI were open to criticism as at least having the appearance of propaganda for Latin, rather than being impartial scientific investigation. Some critics, misled by these flaws, assumed that the whole report was propaganda and condemned it accordingly. In the judgment of the present writer, this criticism is entirely unfounded as to the chapters on objectives, content, and methods, which show a very thorough and fearless attempt to assemble and interpret impartially all the pertinent facts obtainable and which recognize the unavoidable limitations of the sources. It is significant that the abridged edition (New York: American Classical League) is a reprint of only these chapters.

The present writer would criticise the report in regard to the organization of subjectmatter, for it retains the purely formal order of mastery of forms by declensions and conjugations and thus encourages the very emphasis upon these as ends in themselves which the report condemns and limits freedom of expression in the reading material in a very artificial way. If the central principle of the recommended method is sound (as the evidence seems to indicate), then the previ-

ous practice of textbooks is unsound; but the report, as literally interpreted by many subsequent textbook authors, accentuates the defect by withholding all declensions and conjugations except the first and second until the second semester. It is regrettable that the report pays little attention to the junior high school and none at all to units of learning experience larger than particular types of exercise. Most of the occasion for valid criticism in the report is traceable to the strong conservatism on the part of teachers and influential officers of the League which beset the investigators. The wonder is that they went as far toward reform as they did.

Studies of Reading

In the study by Judd and Buswell (227, 1922) and the later one by Buswell (223, 1927), the method of securing a photographic record of eye-movements was employed. This technic secures a mechanical recording of the number of the eye fixations during which perception of the words occurs, their exact location in the line, and their duration in twenty-fifths of a second, with a fairly sure inference as to the field of vision in each fixation. The interpretation is based on the regular forward movement of the eyes along the printed line, the duration of the fixations, and their number per line. A relatively small number of fixations of short duration, with few backward swings, is characteristic of mature reading accompanied by clear comprehension of the thought. Immature reading is marked by frequent fixations, often of longer duration, with much irregular wandering of the eyes back and forth on the page.

In the Judd and Buswell study (227, 1922) the reading material included graded selections from a reading test, poetic and prose literature, textbooks in various subjects, English narrative mixed with French or Latin words, and pure French or Latin narrative. The material was for the most part read silently, but now and then orally as a check. Seven experiments were conducted with as many groups, each with instructions designed to vary the attention and purpose of the reader. The experiments proceeded from simple silent reading with no special purpose set, to reading with instructions to prepare to answer questions, to study carefully, to paraphrase, to make grammatical analysis, to look for peculiar words, to read orally with clear enunciation, to dictate ideas, to reproduce verbatim, to read mixed passages aloud with translation of foreign words, and to translate a pure foreign language passage.

The conclusions were (a) the pattern of the perceptual process varies markedly with the purpose of the reading as well as with the difficulty of the text, and hence the inducing of such purpose is of very great consequence in teaching; (b) skilled readers of a foreign language

acquire a perception pattern essentially like that of reading the vernacular; (c) very good high-school pupils in French really read, though the reading is greatly disturbed when translation is the purpose; (d) even the best high-school pupils in Latin do not read, but merely decipher. On this ground the authors vigorously criticised the existing Latin procedure as entirely barren of any conceivably educative results.

In Judd and Buswell's study, records of the reading of Latin were sought from fourteen subjects—two of the best Latin pupils in each of seven high schools in or near Chicago. All had learned Latin by the usual grammar-dictionary-translation method. In the Buswell study (223, 1927) the records of four of these subjects, taken to be typical, were compared with those of twenty-four Latin pupils chosen from the middle half of their respective classes, which were those of the first, second, and third years. These pupils had been taught to read Latin in the Latin order for the thought without translation. Where possible, word meanings were obtained from the context. Matters of form and syntax were ignored except where absolutely essential to the thought. Much reading was done, and the expression of the pupil's own thoughts in Latin was encouraged.

The records of the translation subjects (from Judd and Buswell) showed a large number of fixations—often ten or more to the word—with such irregular wandering of the eyes that the process has no resemblance to the typical pattern of reading. The average number of fixations per line on the four subjects ranged from 23.0 to 50.8, the regressive movements from 8.5 to 23.0, and the duration of each fixation from 6.2 to 7.3 twenty-fifths of a second. In the reading group with a slightly shorter line than Judd and Buswell's, the median of the individual averages for first-year pupils was 13.0 fixations per line, 2.3 regressive movements, and a duration of 9.0; for the second year, 13.0, 2.5, 9.0; for the third year, 10.5, 2.5, 7.7. The records of the subjects taught by the reading method showed an increasing degree of development of a mature reading pattern, approximating in character for the second and third years that of other foreign languages and less closely that of English.

Buswell reached the conclusions that the method of teaching Latin has a profound effect upon reading habits, and that mature reading habits are as a rule actually attained in high school by the direct reading method but not by the translation method. Pupils trained by the latter decipher but do not read. Two years of study by the direct reading method produce less mature habits in Latin than in modern languages, which may be due to the greater inherent difficulty of Latin or to the fact that the method has not yet been perfected.

The study, like that of Judd and Buswell, is limited by the small numbers involved and by the impossibility of controlling the many

variable factors. It is, however, of very great significance because of the minute analysis afforded by the technic. The use of the findings is left by the author to those who may have access to other types of data—a caution in marked contrast to the sweeping generalizations of the earlier study.

Training in Derivation

Haskell (226, 1923) reported a study in which the experimental factor was definite training in derivative work in combination with, and in isolation from, the ordinary procedures in beginning Latin. The Latin groups were ninth-grade pupils beginning the study of this subject. The non-Latin groups, pupils not taking Latin, were ninth-grade English classes in the same schools. In the Latin groups there were both experimental and control classes. A similar set-up prevailed in the non-Latin groups. In both experimental groups approximately one-fifth of the time was given to derivative work according to a uniform plan of devices and suggestions, in which they were instructed as a group by the investigator. The derivative work included the identification of Latin originals with English filiates and vice versa; explanation of the force of prefix, root, and suffix in Latin-English words; the appropriate use of such words in sentences; and the keeping of a derivative notebook.

The experiment began with about eighteen hundred pupils in five high schools of Philadelphia, continued for two semesters, and closed with 524 paired pupils for whom complete records were obtained. In the final population the sexes were about equally represented and each pair was of one sex only.

All pupils initially were given the *Terman Group Test of Mental Ability*, the *Thorndike Test of Word Knowledge*, and the *Carr Vocabulary Test*. The Thorndike and Carr tests were also used finally to measure gains: the former to show general range of vocabulary, the latter to distinguish between words of Latin and of non-Latin origin.

The weighted average gains for the year on the Thorndike test (100 items) showed the experimental Latin group superior to the control Latin group by 3.5; to the experimental non-Latin, by 3.4; and to the control non-Latin, by 5.0. Of the control groups, the Latin excelled the non-Latin by 1.6. Of the non-Latin groups, the experimental excelled the control by 1.4. On the Carr test (50 items) the superiority in weighted average gains of the experimental Latin group over the control Latin was 4.4; over the experimental non-Latin, 5.3; over the control non-Latin, 7.0. Of the control groups, the Latin excelled the non-Latin by 2.4; of the non-Latin groups, the experimental excelled the control by 1.2. The higher differences offer a presumption of significance. In a comparison of the experimental groups which were

paired on I. Q., the Latin group showed a superior gain for the year on the Latin element in the Carr test (25 items) of 3.4, but an inferiority of .4 on the non-Latin element (25 items). In the Thorndike test they were superior in gain by 3.7.

The author concluded that (a) the use of the derivative notebook, the search for derivatives, and the study of prefixes, roots, and suffixes characterize efficacious work in derivatives; (b) the conventional ninth-grade English course produces a very small contribution to vocabulary range; (c) the addition of etymology to the English course increases the contribution slightly, but not enough to justify the time spent upon it; (d) the conventional beginning Latin course, with little if any derivative study, gives automatically a slightly larger increment than the English course *with* derivative work; (e) with conscious effort in the study of etymology for approximately one-fifth of the time in the Latin class, a large and significant contribution is made to the pupil's English vocabulary.

The study is marked by great care in planning and execution, both to control the variables and to secure standard conditions of testing. It represents a minimum of dislocation of classroom practice; which, however, reduces somewhat the completeness of control. Such variability is fully recognized in the study. The complete omission of primary distributions makes it impossible to estimate reliabilities, and the treatment of groups and schools is not always clear. The conclusions, however, appear unmistakable and fairly valid.

The study by Hamblen (225, 1925) is a companion to that of Haskell (226, 1923) and is based in part on the same experimental data. Hamblen endeavored to determine (a) to what extent transfer of derivative knowledge is increased by making it the objective of conscious effort in Latin (also a problem of Haskell's study), and (b) what methods most favor transfer. The experimental factors were the special provisions for derivative teaching (fairly uniform for the experimental groups) and the provisions for derivative work in the textbooks used in the control groups, which provisions varied with the schools. In all control groups the teachers were instructed to avoid derivation.

Data from 308 pupils (154 pupils paired on the basis of I. Q. as determined by *Terman Group Tests*) were available for study at the end of the first semester. Of these, 118 pairs remained to the close of the second semester, when the experiment ended. The results are mostly measured in terms of word gains on the Thorndike and Carr tests. On the Carr test (50 items) the gains of the experimental group were superior by 4.79. The gain in each group was slightly reduced in the second semester. The superiority of the experimental group was nearly equal for the two semesters but was almost entirely confined to the

Latin element in the test. On the Thorndike test (100 items) the year's superiority in gain of the experimental group was 3.92. There was reduced gain in each group in the second semester, but it was much more marked in the control. The average percent of possible gain (Carr) actually achieved was 20.6 for the experimental group to 9.6 for the control. A comparison of schools on the Thorndike and Carr tests shows a more consistent gain for the experimental group than for the control. Scores on the *Ullman-Kirby Latin Comprehension Test* at the close of the experiment showed an average of the school medians of 9.6 for the experimental group to 9.0 for the control; difference .6, which the investigator accepted as significant.

The devices used and the amount of time spent in experimental derivative work varied somewhat with the schools. Some of this may be reflected in the scores, but not uniformly nor reliably. The evidence was clearer for textbooks. Of the four texts used, two make a "fair amount" of provision for derivative work, one "a little," and the fourth none. All such work was presumably ignored in the control group; clearly so in three schools. The year's average gains on Latin-derived words in the two control groups using the "fair amount" texts were 5.88 and 5.19; for the third ("a little") text, 3.55; and for the fourth ("none") text (two schools), 3.23 and 3.09. The experimental groups using the last-named text also scored lowest in gains on Latin-derived words, but the difference of one to the nearest rival is not statistically significant (.1 in 8.2). That of the other is explainable on other grounds.

Hamblen concluded that (a) without special attention to etymology there was a significant gain in English vocabulary associated with the study of Latin, but it was more marked in words of Latin origin than in non-Latin words; (b) Latin classes with the most favorable conditions for derivative study, including textbook, devices, and specific effort, gained four times as many Latin-derived words as schools with the least favorable conditions; (c) without special attention to derivative work, classes with provision for it in the textbook gained twice as many words as classes with no such provision; (d) there is no conclusive evidence as to the relative efficacy of various devices for derivative teaching.

The conclusions are subject to the same criticisms as those of the Haskell study. The analysis is made with reasonable care, though there are some conclusions which ignore the probable unreliability of the relatively small differences involved, and others (particularly as to the controls) which overlook the possibility of general vocabulary spread.

Objective Presentation

Employing the rotation method Schmidt (228, 1923) studied experimentally the relative effect of objective presentation and non-ob-

jective presentation upon immediate and deferred recall of the meaning of Latin words. "Meaning" referred to association with English equivalents. Objective presentation consisted in freely showing the objects or performing the actions denoted, while the words were being studied. In non-objective presentation, only the printed lessons were used.

Variable factors were rigidly controlled. No subjects had otherwise studied or were studying Latin. Papers of pupils who missed any exercise were omitted. The teaching material consisted of ten lessons, in two blocks of five each, constructed in two forms, A and B, verbally identical, but with one block in form A experimental, the other control. In form B the methods were reversed. Teachers were guided by detailed control instructions. The stating of all sentences in the simplest possible form permitted independent control of the prior or posterior use of the experimental (objective) method, and of the direct or reverse order of lessons within each block. Thirty nouns, thirty adjectives, and forty verbs comprised the experimental vocabulary. Only one other word (*est*) occurred in the lessons. All words were concrete in meaning, and entirely unlike their English equivalents. Distribution of words among the lessons was about equal. Each lesson occupied one fifteen-minute period, two periods being used each day until five lessons were completed, then a sixth period for review and a seventh to test for immediate recall. The following week the second block was given in the same manner, so that the experiment covered two weeks. Deferred recall was tested four weeks after the first test.

Out of 10,753 pupils who began, 4,844 took the final test. The original number represented 131 schools of widely varying size, mostly in the Middle West. About 85 percent were in parochial schools, the rest in public schools. Age and intelligence were disregarded.

The investigator found that the objective method sometimes facilitates both learning and retention, but the former more than the latter. It is not equally advantageous for all words, and its effects may be nullified by loss of interest, as shown by the consistently poorer learning during the second week. No significant differences of sex or grade in relation to method appeared.

Form A was found to yield consistently higher scores (about 2.5) than Form B, and one block of words to be learned better objectively, the other equally as well or better non-objectively. (The author appears to have said the reverse of what he means on page 107.) This discovery led to a count of individual words, from which it was concluded that verbs on the whole were learned conspicuously better by objective methods than by non-objective, while the learning of nouns and adjectives is not so clearly benefited. There are marked exceptions in both groups. Part of the disadvantage in individual words was

thought to be due to the distraction of attention from the word to the object or action.

The study is apparently reliable within its limitations, although the preponderance of parochial school pupils raises a doubt of its representativeness. It throws no light on the learning of words in the direct method, in the functional or the comprehension method, or in any method where, as in ordinary classroom work, the learning of vocabulary goes *pari passu* with the mastery of language structure. Moreover the type of words to which its findings apply is limited to those which are susceptible of objective presentation. The omission of differences and deviations throws an undue burden upon the reader who wishes to judge the reliability of the findings.

Methods Used by Teachers

Grise (224, 1925) reported a questionnaire study in which he endeavored to discover "how the high-school pupil regards and attacks . . . his Latin work, and to what extent there is agreement between what the pupil says he is doing and the things the teacher thinks he is doing or says he should be doing."

The data were obtained by two questionnaires, one to pupils and one to teachers. According to instructions in the pupil questionnaires, they were to be anonymous, and not to be shown to the teachers. The teacher questionnaires were sent later to schools from which pupils had returned replies. Of about 7,500 pupil questionnaires sent, 3,600 were returned and used, representing 280 schools in 267 communities and 41 states. Replies from pupils with less than four years of Latin were discarded. Of 617 questionnaires sent to teachers, 330 were returned and used. These represented 211 schools in 198 communities and 39 states. Those not stated to have been in the present position at least two years were discarded. The data from teachers thus represent approximately a 50 percent sampling of the Latin learning environment of the pupils studied.

The points covered in the pupil questionnaire included the motives for continuing or dropping Latin (the latter based on reports regarding their former fellow-pupils), amount and factors of interest in authors read, methods used by pupils and teachers, the types of questions asked and when asked, and the pupil's preferences among questions. The teacher questionnaire covered the authors read, and the methods and types of questions used.

As relates to method, most of the pupils showed a very great lack of system in attacking their problems; they established no connection with the preceding lesson, used notes and grammatical references slavishly, and looked up new words at once in the vocabulary, often with no effort at first determining form, and usually without first trying to

infer the meaning in more natural and economical ways. They thought that teachers expect them primarily to account for case and clause syntax, and to translate. They were little impressed with the possibility of help from Latin in the English vocabulary.

The striking result of comparison of the two questionnaires was that in those features of method which represent modern practice in teaching, teachers claim to do the very things that pupils say the teachers do not do: namely, make skilful assignments, connect lessons, suggest helpful ways of divining word meanings without recourse to the vocabulary, and bring out the connection of Latin words with their English filiates. There is fairly close agreement on questions of a formal nature, such as translation, syntactical analysis, and inflection.

The author concluded that the type of questions actually asked by teachers, according to the pupils' testimony, profoundly influences the pupils' habits of study; that the teachers profess to be teaching in a much more functional manner than they are, and that the work largely lacks interest and system for the pupils. So far as method is concerned, the data seemed fairly valid and the results convincing. The study furnished no constructive ideas, but does offer several fairly definite bases for experimentation.

Assignment

In an experimental study Bowen (222, 1928) attempted to determine the effect of a specialized type of assignment in the second semester of tenth-grade Latin, by the method of equivalent groups. Two groups of twenty each were equated on the basis of a composite score, representing teachers' marks in first semester Latin, I. Q.'s (Terman Group), and knowledge of Latin syntax (Pressey). Apparently no standard scores were obtained, so that excessive weight was given to the I. Q.; though the investigator claims the contrary. The two groups had been taught by the same teacher and had used the same textbook up to the beginning of the experiment. The experiment was conducted for four months. Subjectmatter, teacher, motivating devices, and roughly the time of day were constant. The experimental factor was the assignment, which always consisted of (a) a sketch of the content of the passage; (b) reading the passage aloud to the pupils, with some comment on sentence structure; (c) sight translation by the pupils from the advance lesson. The control assignment was merely, "Take such-and-such lines."

The investigator concluded that the specialized assignment showed a marked superiority. This statement is probably justified, but the doubtful pairing, the small numbers, the failure to record initial and final scores except on two tests, and the omission of probable errors make the results far from conclusive.

CHAPTER VIII

Music

THREE investigations in the field of music were located. Using twenty women students from the freshman class at the University of Iowa School of Music, Culver (229, 1923) found that students having a high I. Q. or having had relatively copious musical experience, or both, learn piano selections better and more quickly by the "whole method," and that students having only a rudimentary musical experience or having a relatively low I. Q., or both, do better when employing the "part method." The number of cases is too small to warrant acceptance of these findings as more than indications.

Packer (231, 1925), using fifty-two high-school students as subjects, found only slight evidence in favor of teaching songs with the aid of piano accompaniment. Gilles (230, 1909) studied the relative effect of four forms of presenting a series of notes when the purpose is memorization. The forms of presentation were (a) a series of fifteen notes played to the subject who reproduced them on the piano; (b) fifteen notes read from the score and reproduced from memory on the piano; (c) fourteen notes read and played from the score until they could be reproduced from memory; (d) thirteen notes played to the subject who followed the score at the same time until he could reproduce the music from memory. No limit was placed on time or the number of trials. "It seems that the auditory memory is most essential to musicians, and if they are lacking in this, adults rely upon the visual memory, and the children upon a system with which they are most familiar and into which they can fit the thing to be remembered, for example, the use of the symbols. As age increases there is a great tendency to use the visual memory. . . . The motor memory is important in committing to memory. . . . System is the secret of remembering."

CHAPTER IX

Commercial Subjects

THE studies in this chapter are reviewed under the three sub-topics of (a) typewriting, (b) shorthand, and (c) bookkeeping.

Typewriting

In the field of the commercial subjects, the teaching of typewriting has received considerable attention from investigators. The whole versus the part method of learning the keyboard was studied by Fleming (236, 1930), Hainfield (238, 1928), Lomax (239, 1929), and Long (240, 1929). The differences in achievement resulting from the two methods were slight and inconsistent. It appears, therefore, that there is little or no difference in the merits of these two methods.

In an investigation using college students as subjects Gamwell (237, 1925) concluded that the use of nonsense material is a waste of time in learning typewriting. The learner should begin with whole sentence material for practice exercises. Repetition of the same exercise material again and again is not so effective as the constant use of new material. The research technics appear to be satisfactory and the finding of this study corroborates the findings of Hainfield (238, 1928) and those of certain other studies listed in the historical section of his thesis. Since there is no evidence to the contrary, this study seems to indicate that the use of nonsense syllable combinations is of doubtful validity during the period of learning the keyboard in typewriting.

Marik (241, 1929) has reported an experiment in which one class was taught by the "dictaphone" method and the other, by the traditional textbook method. The data collected indicated that learning to typewrite by the dictaphone method does not seem to result in either a greater degree of speed or of accuracy than learning to typewrite by the traditional method. As the author suggested, the study is too limited to settle the question. Its results are not in agreement with those indicated by Pearson (244, 1926) in the first volume of the *Iowa Research Studies in Commercial Education*. In a more recent experiment Pearson (243, 1928) compared instruction using the thousand commonest words arranged in sentences with the dictaphone method. Neither method was significantly better than the other, but both were shown to be much superior to the traditional method.

The effect of rhythmic music during the period of practice was studied by Rulon, (246, 1929) who found no significant difference be-

tween the achievement of a group which had been taught by this method and that of a group which had practiced without music. This result is in agreement with the conclusion reached by Entwisle (235, 1928).

In an extensive investigation including ninety-five schools, Young (247, 1931) administered a battery of tests to 3,300 students. In seventy-five of the schools only a single period was devoted to typewriting. When the scores were assembled on the basis of the period devoted to the instruction it was found that the single-period group median was twelve points ahead of the double-period group median. If double periods are as valuable as have been maintained in former years, the double-period group should have scored many points higher. Many of the teachers who participated in the experiment believed that the double periods belong to the antiques of high-school commercial teaching. The study seems to be extensive and to have been accurately and adequately handled. It appears to provide significant data on this question of double and single periods and should perhaps be brought to the attention of the accrediting agencies which have in the past required double periods for typewriting credit. Apparently double periods are economically unjustifiable.

In the investigation of Coutts (233, 1930) a battery of typing tests was given to 350 students, who were under the care of teachers of typing all the class period, in forty-nine small high schools in the Middle West. The same tests were given in other high schools to 350 students who had only indirect supervision, that is, the teacher in charge was teaching another class at the same time. The supervised group was superior to the unsupervised group in every part of the test, and its composite score was 41.7 points higher than that of the unsupervised group. It may seem that this is a study of a self evident truth, but the mere fact that the investigator was able to find as many schools using the unsupervised system as she did, indicates that, while opinions as to its worthwhileness may be pretty well crystallized, the proof has been lacking until this study provided it.

In Crews' study (234, 1928) of the effectiveness of finger gymnastics in learning typewriting, two high-school classes used the same textbook, drills, exercises, and tests; but one was given finger gymnastics about five minutes each day, while the other was not. The two groups were practically equivalent in age, intelligence, training, and school marks. The non-gymnastic class reached the Blackstone norm by the end of the sixth week and the gymnastic class, by the end of the fourth week. At the end of the period the class using finger gymnastics wrote about 20 percent better than the one not using the exercises. The study was very carefully made and is as accurate as is possible for small groups. While the results were not conclusive, they were such as to

make the thoughtful instructor wonder whether formal gymnastics at the typewriter are not, after all, worthwhile in spite of the fact that typing textbooks have tended to discard them during the past few years.

Shorthand

Munkhoff (242, 1929) studied the relative effectiveness of three methods of teaching shorthand—the ordinary manual method, the direct reading method, and the direct writing method. In six schools the teachers arranged to teach one class by each method and to give tests periodically and to report results. The direct reading approach suggested by Brewington and used in the experiment of Munkhoff is described in the first volume of the *Iowa Research Studies in Commercial Education*. The direct writing approach involves writing content material from the first lesson without learning the characters separately. It also involves early teaching of transcription. Shorthand penmanship as such is ignored. The classes were tested periodically in principles of shorthand, on reading of shorthand, on dictation and transcription, on shorthand penmanship, on multiple choice questions, and on recall questions. There was little difference in ability among the three types of classes in any test except in transcribing, in which the direct writing class showed decided superiority. Although no data are given as to the reliability or validity of the tests used, the number of cases involved is sufficient to give some degree of validity to the findings. The lessons provided in the teacher's manual of the direct writing approach appear to the reviewer to be consistent with modern psychological principles of teaching; more consistent than either the older manual method or the newer direct reading method of shorthand teaching. Since transcription is perhaps the most important single element in the teaching of stenography, it appears that the direct-writing method is worthy of study.

Rierson (245, 1929) reported an experiment in which she used as subjects two groups of fourteen each of third-year high-school students equated by average school grades for previous years. Group A followed the Gregg Manual Method, beginning each lesson with individual letters, rules, and practice on isolated words, and ending with reading and writing connected sentences. Group B followed the same procedure except that connected sentences were substituted for isolated words. On eight tests dictated at speeds ranging from twenty to fifty words a minute, Group A's errors for all tests ranged from 3 to 281 per individual, with a mean of 63.7. For Group B the errors ranged from 0 to 134, with a mean of 24.28 errors. Although the number of cases was too small to make the results of this study highly dependable, they are suggestive.

Bookkeeping

Atkinson (232, 1928) reported an experimental study in which three approximately equivalent classes in bookkeeping under the same teacher were taught by different methods. The experiment covered twelve weeks. One group was taught by the journal approach, one by the ledger approach, and the third by the balance-sheet approach. The students were tested by a battery of ten tests in bookkeeping, including one by Lund, seven from the series by Carlson, three by Jackson, Sanders, and Sproul, three by Elwell and Toner, and one by the author. The median score of the journal-approach group was 80.99, that of the account-approach group, 83.64, and that of the balance-sheet-approach group, 90.14. The accomplishments of the last group compared favorably with those of pupils who had had a much longer period of training. While the number of cases involved was too small for final judgment, this study tended to provide some of the data needed on the much discussed problem of methods of approach in bookkeeping.

CHAPTER X

Home Economics

STUDIES of methods of teaching home economics which would qualify as research are limited in number, especially in comparison with those relating to curriculum, measurement, supervision, and administration.

Three recent events promise to improve the present status of research in home economics in general. The appointment of a research specialist on the Federal Board for Vocational Education has already served to unite workers interested in research. It has also made possible some publicity of studies already completed. The second noteworthy fact is that the home economics division of the American Vocational Association has formed a committee on research in home economics education. The third agency designed to promote research is the American Home Economics Association, which has recently appointed a committee on research. It may, therefore, be assumed that the next ten years will show increased quantity and quality of production in this field.

Of forty-two titles discovered after careful and extended search, all but seven were of the following types: unpublished theses with no available circulating copy, material of a descriptive or expository nature not considered as reports of research, service studies with local application, and material not strictly related to special methods of teaching home economics.

Research Investigations

Braithwaite (248, 1930) attacked the problem of determining whether results in the teaching of foods may be accomplished in single periods comparable to those obtainable when double periods are available. On the basis of intelligence of pupils, social status of patrons of the school, and supervisor's ratings on the instructors, pupils in three classes operating on a fifty-seven-minute period were matched with pupils in three other classes operating with an eighty-six-minute period. At the conclusion of an experimental period of ten weeks, the author, judging from relative gains in scores on an objective information test, concluded that ninth-grade pupils may be taught foods as effectively in one-hour class periods as in double periods and that bright pupils do even better in the shorter periods.

In addition to a summary of the theoretical advantages and limitations of the individual assignments in teaching clothing classes in the

grades, Sell (254, 1930) reported opinions of pupils as practically unanimously favorable to individual assignments.

Lampert (252, 1927) gathered opinions of 104 directors of home economics teacher-training classes and supervisors and teachers of home economics relative to the value of pupil notebooks in teaching textile and clothing classes in high school. Favorable opinions outnumbered unfavorable opinions seventy-nine to twenty-five.

Chadderdon (249, 1927) studied the distribution of time given in class meetings to the following types of activities: school mechanics and class routine, 20 percent; unproductive activity, 7 percent; developing skills and habits, 33 percent; acquiring information and knowledge, 24 percent; doing reflective thinking, 14 percent; developing correct mind set, 1 percent; and developing personality, 0 percent. The fundamental data were gathered in visits to forty-nine home economics classes taught by thirty teachers in thirteen schools in Illinois and Indiana. The percentages above constitute the principal factual findings.

The survey of the frequency of certain practices in teaching by home projects, reported by Harrell (250, 1929) was based on questionnaire replies by 359 teachers in all sections of the United States. Among the topics studied were the following: the amount of credit given, the time required for completion, the requirement of written reports, and the carrying over of projects into the summer vacation.

Another questionnaire study was reported by Kuenzel (251, 1927), who attempted to discover, by an examination of a large portion of the available authoritative literature, the approved methods of teaching home economics and to determine to what extent these methods are actually employed. The results were based on sixty-three reports from California teachers.

In an attempt to discover the relation of certain factors to retention of information taught in high-school home economics classes, Mencke (253, 1928) concluded that retention is closely associated with understanding and interest, and that drill is superior to laboratory work and memorization.

Summary of Findings

The following points from the various studies, though not sufficiently substantiated to be completely accepted, should be taken into consideration in planning the teaching of home economics in the high school:

- (1) Ninth-grade foods work can be successfully taught in sixty-minute class periods.
- (2) It seems possible to measure ability in a managerial skill indirectly through a carefully prepared objective test.

- (3) A test meal may be controlled and standardized.
- (4) There is a great range of teaching methods and devices now being used by home economics teachers.
- (5) Routine factors of laboratory and classroom management consume an excessive amount of class time.
- (6) Understanding and interest are of primary importance in the retention of facts.
- (7) Situations for character building are plentiful in home economics classes.
- (8) The majority of teachers favor notebooks in textiles and clothing classes.
- (9) Among the difficulties experienced by home economics teachers, difficulties of methods of teaching ranked first.
- (10) The time spent on home projects is variable, but the median is thirty hours per project.

CHAPTER XI

Industrial Arts

CASTLE (255, 1928) attempted to ascertain whether a certain new method of teaching mechanical drawing is superior to a method commonly used in high schools. The new method involves the use of certain "standard models" which can be placed together so as to form other more complicated "objects." By their use, with blueprints of each before the pupils, the early reading of blueprints is taught. After ten objects have been formed from the standard models by means of following blueprints of such objects, the pupils are required to make drawings of the objects formed. He concluded that the new method is distinctly superior to the "usual method." The study was carried out with considerable care under very favorable conditions and Castle's method is well worth consideration as a means of improving the teaching of mechanical drawing.

Edgerton (257, 1919) reported a series of experiments to determine the relative desirability of shop projects which are useful when completed and of undertakings which are engaged in primarily as exercises for the development of skill. The first experiment was made in a group of sixteen boys in a printing class. The boys "had gained a good understanding and some skill in composition, stone-work, proof-reading and correcting, making up forms, press work, distribution, and the other important processes typical of the print shop during the first nine weeks of the course." They were divided into two groups and designated groups "A" and "B" respectively, "each group being composed of eight boys having equal ability, as nearly as could be judged from their previous work in printing." The boys in group "A" were given a job in setting straight matter. They were given a choice among four pieces of copy. The matter was for an important use and the boys were told of its use. Some matter rearranged so as to be valuable only as exercise work was given to group "B." The results were that each boy in "A" was more accurate than the corresponding boy in "B." The "A" boys seemed to show more interest and were "more systematic and business-like in their work." The boys in group "A" finished their respective work in 39.7 percent less time than it took the members of group "B" to complete theirs. The percentage of time saved by any one individual in group "A" was neither greater than 53.2 percent nor less than 27.8 percent. Later the experiment was repeated by reversing conditions in the two groups and the results were similar. Other similar

experiments were made with classes in woodwork and in metalwork, and in each case results similar to those in the printing experiments were obtained. Edgerton concluded that "it would seem that the psychological and sociological needs and interests of boys from twelve to fifteen years of age are mainly in real productive rather than series of exercises, models, pieces, or whatever else you may call them." Also that time is saved for the development of "industrial intelligence and thinking power in connection with real life situations" when useful projects are taught.

Deaver (256, 1928) collected a variety of tried devices in the field of shop teaching. The material was gathered by soliciting various ways and means of doing things in thirty personal interviews with experienced shop teachers of five different types, wood, sheet metal, electricity, general mechanics, and mechanical drawing. In preparation for these interviews books and magazines were reviewed, and talks on industrial arts were heard and evaluated. From these and the writer's five years of experience in shop teaching, a set of twenty-four questions for use in reviewing was formulated. In the thesis the numerous methods discovered are described under the following headings: methods relating to the tool room; the demonstration; instructional devices; grading; motivation; fundamental principles of shop procedure; and discipline.

The author also stated the following conclusions relative to the trend of modern shop teaching methods:

- (1) There is a strong tendency toward combining the individual, the group, and the class methods of teaching shop work.
- (2) Disciplinary problems are being analyzed for cause and effect and corrective measures based on sound psychological principles are being applied.
- (3) The pupils are encouraged to participate in the routine duties of class procedure.
- (4) The unreliability of teachers' marks is being recognized and new methods are being evolved.
- (5) Training in the intangible elements of good citizenship is assuming an important place in shop work.
- (6) The demands of industry are being emphasized in school shop training.
- (7) The use of books, trade literature, and other related materials is increasing in school shops.
- (8) Individual differences are being recognized and provided for.
- (9) Immediate goals are being set up.
- (10) The work of the school, the home, play, and the after-school job of the boy are being correlated.
- (11) The related factors developed incidental to the work of the shop, as the desire to continue in the work, the attitude toward manual labor, the desirability of a trade, etc., are being recognized and controlled.
- (12) The development of desirable habits of work is being emphasized.

CHAPTER XII

Moral and Character Education

SERIOUS difficulties obstruct researches in the field of character education. Measuring units have not been devised. The elements involved in character are many, and the isolation of particular elements is very difficult. The measurement of each element with any degree of reliability would require the study of large numbers of cases over considerable periods of time.

Very few objective researches have been made in the field of direct training in character at the secondary-school level. Several studies involving elementary-school pupils include children in the seventh and eighth grades. Armstrong (258, 1929) attempted to evaluate the effectiveness of direct methods of developing habits and ideals of cleanliness, accuracy, school loyalty, character urges, and making decisions. The experiment involved a thousand children, and the experimental period was continued for an entire school year. As measured by performance tests of school behavior in cleanliness, accuracy, participation in school enterprises, character urges, and decision making, the experimental and control groups showed no significant differences in gains except in cleanliness. The study also suggested that bright pupils improve as well or better by incidental instruction, but that dull pupils profit most by direct instruction.

Petite (269, 1928), studying the relative effectiveness of instructional and developmental methods of character education, employed the pupils of two paired rural graded schools. At the conclusion of a year, during which time the experimental conditions were continued, results on the Athearn cardboard honesty test favored the developmental method.

In an attempt to evaluate the relative values of instruction in Biblical information, instruction in applied ethics, training in habits of worship, and the use of selected altruistic projects as means of character training, Tuttle (270, 1929) used as subjects 150 elementary-school youngsters, including twenty-five seventh-grade pupils. Three tests were employed: (a) a test of religious ideas (after Watson); (b) *Hill's Civic Attitudes Test*, and (c) a specially devised performance test of honesty in contests for prizes. The small numbers preclude any great dependence upon the results, which suggested that instruction in applied ethics is at least as effective as the other three types of training, and that there is some value in each type.

Several valuable studies have been made which bear only indirectly on the problem of direct character education. Both Case (260, 1930) and Franklin (263, 1927) described technics for allocating materials in a proper grade sequence. Slaght (268, 1928) studied characteristic differences between untruthful and truthful children and reported that differences in I. Q. were negligible, but that there was significant correlation between truthfulness and moral comprehension, suggestibility, slowness of reaction, extent of apperceptive system, emotional stability, and good home environment.

Several descriptive studies are suggestive, among which are Jones' (267, 1928) study of dramatics as a method in character education, Ward's (271, 1928) exposition of self analysis as an educational means of character development, Elam's (262, 1926) subjective evaluation of methods of conducting moral training in the schools, Burnham's (259, 1927) comparison of indirect versus direct methods and a course of study for grades one to twelve, and Dougherty's (261, 1928) discussion of aims and methods in character education.

A very excellent study of the status of the teaching of morals in the public high schools as of 1925 was reported by Golightly (264, 1926).

While no great significance can be attached to the conclusions reported, there is considerable significance in the technics developed. Shuttleworth's method of measuring the influence of environment is available for much wider use. Tuttle's method of omitting one causal element of study, rather than adding, may prove to be of value in studying the complicated elements of character education. Watson's technic in his *Test of Public Opinion* offers the most promising means of measuring subjective changes. The field invites careful studies, especially in the light of the rapid increase of interest in character education.

CHAPTER XIII

Physical Education

KULCINSKI (275, 1929) reported an investigation carried on in connection with four freshmen classes of thirty each in tumbling stunts at the University of Illinois. Each of the four classes was conducted by a different method of procedure as follows: (a) formal method, all learning activities practiced in unison at the command of the instructor; (b) informal method, all learning activities practiced under the general guidance and personal supervision of the instructor; (c) combination method, a predetermined combination of the first and second methods; and (d) control group, no instruction beyond a demonstration of the activities though the class members were required to practice throughout each class period. Each individual's ability to perform the activities was tested at the beginning and end of the semester, which included thirty class meetings of thirty minutes each. The data secured favored the informal method as the most effective teaching procedure. The study has the special merit of having been conducted under actual class conditions.

East (274, 1927) studied the effect of coaching upon the acquisition of skill in the basket ball free throw. A group of girls at the University of Wisconsin was used as subjects. One group of seven was given no instruction and permitted to use any method or number of methods they wanted to try. A second group of three was given the theory of the throw with no subsequent instruction and left to apply the theory as they could. The third group of nine was coached by the author. All practiced a total of twenty-one times. Each practice was limited to twenty-five throws. The findings were in favor of coaching. Because of the limited number of subjects included in the study this conclusion cannot be considered as "completely conclusive."

Price (276, 1931) studied the learning of foot-skills in soccer football. The study included three types of experimental procedure: (a) stationary ball—in which the ball was placed on a definite spot in front of the subject and kicked at a target in front; (b) moving ball—in which the ball was rolled at a known angle from behind the subject and kicked at a prearranged target in front; (c) hidden ball—in which the ball was rolled from an unknown angle from behind the subject and kicked at a target that was designated at the time the ball was released. Each of the six subjects made forty trials in each type of test. Each trial included sixty kicks—thirty with each foot. The author

presented a rather long list of conclusions. The following relate to methods:

1. The mental attitude of the learner was a significant factor in learning.
2. The knowledge of one's score served to motivate the learner.
3. There was a direct relationship between first performances and later performances. Success in the first trial was associated with better scoring; failure in the first trial was associated with poorer scoring.
4. Kicking the ball with the side of the foot was more accurate than kicking by any other method.
5. Keeping the eye on the ball before and while kicking increases accuracy in kicking.

It may be added here that the study contributed little, if any, new information relative to the learning of skills. The chief contribution was a technic of studying the learning of foot-skills in soccer.

Atkinson (273, 1928) undertook to investigate the methods of teaching physical education activities used by trained teachers and recommended in syllabi and texts; and from this investigation she presented what in her opinion constituted the most effective and most useful methods for teaching these activities. The investigation and report covered all the activities found in common use in the State of California, which for purposes of convenience were classified in five groups—folk dancing, natural dancing, clog dancing, athletics, and gymnastics. A chapter is devoted to presenting selected teaching procedures for each of these groups.

The thesis made no significant contribution to the literature on physical education. The most worthwhile feature of the report was the achievement tests which were presented in connection with each of the activities studied. These tests or other similar tests might advisedly be adopted in connection with all classes in physical education.

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BY
J. J. ...